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Theophrastus on Herbals and Herbal Remedies

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Theophrastus of Eresos (c. 370-288/85 B.C.) was the outstanding student of Aristotle, and is famed in the history of Western literature for his lampooning *Characters*, as well as numerous treatises on botany, petrology, and other subjects in natural history.[1] Best known is the *Historia Plantarum*, which formed the base for all succeeding studies of plant lore and classification until the Linnaean system.[2] Taking Aristotle's methodologies, illustrated in the *Historia Animalium*, *De Partibus Animalium*, and other zoological works, Theophrastus produced a botanical guide that displayed the best in the Peripatetic approaches to the world of nature.

There is some controversy over the authenticity of *Historia Plantarum*, IX, in which herbs and herbals appear. It is argued that there may be some genuine "Theophrastean" matter in Book IX, but that an unknown *rhizotomos* ("root-cutter") was the author.[3] In a recent survey of herbal documents, Stannard remains uncertain about Book IX, and his conclusion that "Book IX of Theophrastus' *History of Plants* ... is possibly spurious"[4] is typical of most essays touching on the subject. The problem is centered on the topics in Book IX, which seem at variance with the remainder of the treatise, but Einarson has shown that the best witnesses in the MS tradition do include Book IX.[5] Further-

1. The best summary is O. Regenbogen, "Theophrastos," *Real-Encyclopädie der classichen Altertumswissenschaft* suppl. VII (Stuttgart, 1940), cols. 1354-1562 (1435-1479: botany); this work is hereafter cited as *RE*.

2. The first edition of Carl Linnaeus's *Species Plantarum* appeared in 1753. A two-volume facsimile edition has been published (London: The Ray Society, 1957-1959), with extremely useful introductions and appendices by John L. Heller and W. T. Stearn. See also John L. Heller, "The Early History of Binomial Nomenclature," *Huntia, 1* (1964), 33-70.

3. Hugo Bretzl, *Botanische Forschungen des Alexanderzuges* (Leipzig: Teubner, 1903), p. 366 and n. 24.

4. Jerry Stannard, "The Herbal as a Medical Document," *Bull. Hist. Med., 43* (1969), 213.

→ Benedict Einarson, "The Manuscripts of Theophrastus' *Historia Plantarum*," *Class. Phil., 71* (1976), 67-76, esp. 68-69 with U*.

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more many doubts about the textual contents of Book IX result from the state of corruption, interpolation, and omission in the MSS, especially those sections after IX, 18.

According to the usual definition of "herbal," Book IX of the *Historia Plantarum* would not qualify as one in *isolation* from the remainder of the work. Descriptions of the various plants are detailed in the main body of the treatise, while their medical properties are singled out in Book IX. But if Book IX is taken together with the previous descriptions, – it does fall under the definition given by Lawrence: "a book on plants of real or alleged medicinal properties, which describes the appearance of those plants, and provides information on their medicinal importance and use."[6] Book IX qualifies as an herbal; in fact it is the earliest herbal in Greek that has come down almost complete.

In the introduction to his edition of Theophrastus's *De Lapidibus*, Eichholz writes, "Theophrastus . . . mentions the medical properties of no earths, and of only one stone . . . Similarly, he excluded pharmacology from his treatise on plants."[7] Likewise, one reads in the standard *Kremers and Urdang's History of Pharmacy* that Theophrastus "was primarily a botanist," and that Dioscorides was "the first to deal with medical botany."[8] Whatever one may believe about the authenticity of Book IX of the *Historia Plantarum*, there is ample evidence in the rest of the work, and in *De Causis Plantarum*, that attests to Theophrastus's great interest in medicinals, and plant medicinals in particular. Omitting *Historia Plantarum* IX from consideration of the Theophrastean *corpus* does grave injustice to the history of ancient botany and ancient pharmacy: here are medicinals, derived from plants – and one animal. Moreover, Theophrastus assimilated much information from the writings of Diocles of Carystos (fl. in the time of Aristotle, 384-322 B.C.),[9] a

6. George H. M. Lawrence, "Herbals: Their History and Significance," in *History of Botany* (Los Angeles: University of California Press, 1965), p. 3; quoted in Stannard, "Herbal," p. 213.

7. D. E. Eichholz, ed., *Theophrastus: De Lapidibus* (Oxford: Clarendon Press, 1965), p. 7 and n. 2.

8. Glenn Sonnedecker, rev., *Kremers and Urdang's History of Pharmacy*, 3rd ed. (Philadelphia: Lippincott, 1963), p. 15.

9. Werner Jaeger, *Diokles von Karystos* (Berlin: De Gruyter, 1963), esp. pp. 114-123. Fragments of lost Theophrastean writings suggest a deep interest in medicine and pharmacology. Regenbogen, "Theophrastos," cols. 1426-1434, esp. col. 1427, nr. 3. F. Wimmer, ed., *Theophrasti Eresii: Opera* (Paris: Didot, 1866, reprint of Teubner, ed., 1854-1862), collects a number of fragments (incomplete) that illustrate this diversity of interest. Two examples among many will serve to demonstrate the "medical" aspects. Frag. 117 (Wimmer, p. 445) is from

physician who lived in Athens, and this puts Theophrastus in context with some of the important developments in Greek medicine and anatomy. Diocles was not one of the local *rhizotomoi* ("root-cutters"),[10] but a doctor who left a reputation for dissection and medical investigation of all kinds.[11] The list of Diocles' works is wide-ranging, and includes those on drugs.

Theophrastus tells us that he has procured much information from the *pharmacopōlai* ("drug-vendors") and *rhizotomoi*,[12] but Wellmann has shown that some basic medical data in *Historia Plantarum* IX came from the works of Diocles.[13] Theophrastus and Dioscorides,[14] as well as Apollodorus/Nicander,[15] used Diocles' materials on plants as medicinals. A number of fragments, collected by Wellmann,[16] clearly indicate Diocles' abilities; several of these fragments prove that Diocles' observa-

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Athenaeus, X, 429b, on how Theophrastus records (in an untitled work) that Miletus had a custom that women drink water, but no wine; earlier the fragment records that one suffered death for drinking unmixed wine if he did so without a doctor's prescription to effect a cure. Frag. 178 (Wimmer, p. 461) is from Theophrastus's *Biting and Venomous Animals* and *Animals That Live in Holes* (the electric ray fish) = Athenaeus, VII, 314b-c. Galen (ed. C. G. Kühn), VI, 190 = K. Koch, ed., *Galeni De Santitate Tuenda* (Leipzig: Teubner, 1923 [*Corpus Medicorum Graecorum*, V, 4. 2]), III, 5.2-3 (Koch, p. 84), says that Theophrastus wrote a book (possibly titled *On Fatigue*) wherein gymnastics and medicine were combined.

10. M. Wellmann, *Die Fragmente der sikilischen Ärzte Akron, Philistion und des Diokles von Karystos* (Berlin: Weidmann, 1901), pp. 117-207 (fragments), as contrasted with the statement in *Kremers and Urdang's History of Pharmacy*, p. 15.

11. Wellmann, *Fragmente*, p. 117 (list of titles).

12. *Historia Plantarum*, IX, 8 passim; 11.7 and 9; 15.2; 16.3; 18.3 and 10; 20.4; henceforth this work is cited as *HP*.

13. Max Wellmann, "Das älteste Kräuterbuch der Griechen," in *Festgabe für Franz Susemihl* (Leipzig: Teubner, 1898), pp. 1-31, esp. pp. 22-31.

14. Theophrastus, *On Perspiration* (ed. Wimmer, pp. 403-408 [frag. 9]), p. 403, (2), 35-42; and p. 407 (30), 44-46. Wellmann, *Fragmente*, pp. 87-88. Wellmann, "Kräuterbuch," pp. 20-22, shows the common source from Diocles in Nicander and Dioscorides.

15. It is quite clear that Nicander had no competence in the subject matter of the two extant poems, *Theriaca* and *Alexipharmaca*; he borrowed (and mangled) the data in the works of Apollodorus (fl. sometime in the third century B.C.), who, in turn had borrowed some of the materials from the works of Diocles. M. Wellmann, "Apollodoros," *RE*, I, pt. 2 (Stuttgart, 1894), nr. 69, col. 2895. Franz Susemihl, *Geschichte der griechischen Litteratur in der Alexandrinerzeit*, 2 vols. (Leipzig: Teubner, 1891-1892), I, 784-785. John Scarborough, "Nicander's Toxicology, I: Snakes," *Pharm. Hist., 19* (1977), 3-23.

16. Wellmann, *Fragmente*, p. 117.

tions on pharmacology and plant medicinals were embedded in Theophrastus's works, especially Book IX of *Historia Plantarum.*[17]

Diocles' and Theophrastus's herbals, however, are far simpler than the multisubstance remedies that would be preserved by Nicander, Dioscorides, Galen, and later writers in Greek and Roman pharmacology. Moreover, Theophrastus seems uncertain about the definition of "herbal" as his sources of information had given it to him. Implicitly, silphium, frankincense, and myrrh do not form part of Theophrastus's medicinals,[18] although he does give myrrh as part of one of the few multisubstance remedies in the short *On Odors* (35). Once he has given his description of frankincense and myrrh, he attempts a definition of herbs (*poai*), which will include juices (*opoi*) not described previously.[19] These will be those substances which have "medical powers,"[20] and will comprise "extracted juice" (*chylismos*), "fruits" (*karpoi*), "leaves" (*phylla*), and "roots" (*rhiza*), because the *rhizotomoi* call "herbs medicinals,"[21] and they consist of these parts. This hesitant definition of "herb" may have been borrowed from Diocles or the *rhizotomoi*, but Theophrastus may have invented it on his own. The *rhizotomoi* had given him a piece of his basic information, because the *rhizotomoi* do not call all their roots herbs, but only those from the class of medicinals, or healing plants, or healing parts of certain plants.[22] Theophrastus still seems uncertain of his definition, because he continues by distinguishing those potencies (or "powers" [*dynameis*]) of roots which are general from those *dynameis* in roots which have use in healing or medicinals (*pharmakōdeis*). Thus roots which are medicinal include all four parts of the plant, especially the leaves, as root-cutters themselves say; consequently, "herbs" are all four parts, not just the roots.[23] Theoprastus gives full credit to the *rhizotomoi* and their imprecise descriptions, but he attempts to put some kind of label on their empirical

17. Ibid., nr. 150 (p. 191, from *Rootcutters*): *Scholia on Theriaca*, 628, compared with Nicander, *Theriaca*, 628, Dioscorides, *Materia Medica* (ed. M. Wellmann), III, 31 and 49, and Theophrastus, *HP*, IX, 11.1. nr. 152 (pp. 191-192, from *Rootcutters*): Erotian, *s.v.* σησαμοειδές (120, 6 Kl.) with Dioscorides, IV, 149, Rufus in Oribasius, II, 109, Strabo, IX, 418, and Theophrastus, *HP*, IX, 9.2. See also nrs. 156, 160, and 166 (the last from Theophrastus, *On Stones*).

18. *HP*, IX, 1 and 4.

19. Ibid., 8.1.

20. Ibid., φαρμακώδεις δύναμεις.

21. Ibid., καλοῦσι γὰρ καὶ πόαν ἔνια τῶν φαρμακωδῶν οἱ ῥιζοτόμοι.

22. Ibid., 8.2.

23. Ibid., τῶν δὲ ῥιζῶν πλείους μὲν εἰσιν αἱ δύναμεις καὶ πρὸς πλείω.

notions. What follow are "herbs," and only a few "herbals": plants are listed with only an occasional combination with other plants; yet his "herbs" are "herbals," because the medicinal properties of each plant are assumed to act singularly, most often with water, honey, and olive oil.

Lists of beneficial and harmful plants and extracts are as old as civilization, and the *Syriac Book of Medicines* suggests, as one example, how such listings became jumbled together over millennia.[24] Budge quotes from the Assyrian Kuyûnjik Collection a description of how Sennacherib (705-681 B.C.) "planted . . . all the herbs of the land of Khatti,"[25] and shows how many of these early prescriptions became embedded in later compilations that came to include Greek and Roman authors.[26] Among the Greeks is Diocles of Carystos,[27] along with a host of other authorities, both very ancient and quite recent.[28] Contained in the *Syriac Book of Medicines* are many folk traditions, side by side with the conclusions of the best Greek and Roman doctors and pharmacologists. So also Theophrastus has inherited a long history of empirical observation, which he records in Book IX of *Historia Plantarum*, but he puts these notions about "herbs" into the Peripatetic framework and classification system, which had served so well in the first eight books of *Historia Plantarum*, as well as in *De Causis Plantarum*. Each herb that is listed in Book IX meets his definition of "medicinal," as he has set it down in IX, 8.1 and 2, and sometimes that definition will lead Theophrastus to include nonbotanical matter.

Unlike the muddled nomenclature of snakes,[29] spiders, certain minerals,[30] insects, and other animals that might be employed in medicine, or that might be mentioned in the Greek texts of medicine and pharmacology, plant nomenclature is slightly more assured. A multitude of names was applied to poisonous snakes, for example, while plant names

24. E. A. Wallis Budge, ed. and trans., *Syrian Anatomy, Pathology, and Therapeutics, or "The Book of Medicines,"* 2 vols. (London: Oxford University Press, 1913).

25. Ibid., I, cxlviii.

26. The list includes Asclepiades of Bithynia, Galen, Hippocrates, Diocles, and several others.

27. *Syrian Anatomy*, I, 19-20 (Syriac text) and II, 18-19 (translation). Wellmann, *Fragmente*, could not include this Syriac fragment in his collection.

28. *Syrian Anatomy*, I, clxix-clxxi (summary of prescriptions that have association with famous physicians).

29. Scarborough, "Nicander's Toxicology," pp. 3-23.

30. John Scarborough, "The Drug Lore of Asclepiades of Bithynia," *Pharm. Hist., 17* (1975), 43-57 (49: *nitron*; 53-54: Sal Ammoniac).

in Theophrastus, Nicander, Dioscorides, Galen, and others have some consistency that helps in modern identification. Specific plants had names recognized throughout the Greek world, and where there is doubt, modern Greek sometimes preserves an essential word or core that helps key modern nomenclature.[31] Once a plant is keyed, one may determine through modern biochemistry and pharmacology if the substance had beneficial or harmful effects. Quite often, empirical observation as recorded by Theophrastus or Diocles is correct, although the manner of description fits the Peripatetic mold.[32]

In keeping with the traditions of Greek agriculture, as well as the structure of the entire *Historia Plantarum*,[33] Theophrastus describes how these useful medicinals will be gathered: by season and by method. The best juices are collected in the summer, while the most useful roots are gathered at the time of the wheat harvest (spring) or after the rising of Arcturus (autumn), when the plants "have lost their leaves or fruit."[34] Part of the method of gathering juices includes the part of the plant: stalk, root, and head. Juices from the stalks come from most plants, examples being wild lettuce and spurge. Theophrastus provides no examples for the class of "root-juices," perhaps in keeping with his previous definition of the "root" as the "whole" plant. The poppy (*mēkōn*) yields it juice from the head, the only plant so treated.[35] Subsumed under method of collection, following season and parts, are the actual procedures used in collecting: incisions, bruising, and cutting. Those plants with an abundance of juice have their sap collected into jars or vessels made for the purpose; probably Theophrastus implies this method for those plants that yield juice from their stalks. Those plants having little sap from the stalks had their juice absorbed into a ball of wool, as with *thridakinē* (*Lactuca scariola* L., "wild lettuce").[36] In the bruise method, the plants were cut down, water was poured over them, the fluid was strained, and the sediment retained.[37] This was the method

31. R. M. Dawkins, "The Semantics of Greek Names for Plants," *J. Hellenic Stud., 56* (1936), 1-11.

32. Pseudo-Aristotle, *Problems*, I, esp. 41, is a good parallel example.

33. Theophrastus valued – and named – the following agricultural writers: Chartodras, Androtion, and Satyrus. See note 142, below.

34. *HP*, IX, 8.2. *Cf.* Hesiod, *Works and Days*, 248.

35. *HP*, IX, 8.2.

36. *HP*, VII, 6.2 ("wild" lettuce). Theophrastus recognized several types of "wild lettuce" (*HP*, VII, 4.1 and 5). Θρῖδαξ (*Lactuca sativa* L.) is "lettuce" (*HP*, VII, 4.2 and 9).

37. *HP*, IX, 8.3, with Dioscorides, III, 7.

employed with the "roots" of hemlock (*kōnion*), which were thought to be more potent than the fruit,[38] and with *thapsia* (*Thapsia garganica* L., "deadly carrot").[39] In the cutting method, there was no variety, except in the seasons, either summer or autumn; hellebore is given as the example: the slender lower roots were taken, because the thick upper ones were considered useless.[40] Theophrastus does not distinguish which *helleboros* he means in this passage.

Before Theophrastus begins to list his "herbals," he prefaces the listing with some statements of the *pharmakopōlai* ("drug-vendors") and the *rhizotomoi*. This section (*Historia Plantarum*, IX, 8.5-8) illustrates quite vividly Theophrastus's sources of information, other than Diocles. The drug-vendors and root-cutters advise that one should cut roots only when standing to the windward, especially for *thapsia*; furthermore, one should oil his body first, before cutting the roots. The rest of IX, 8.5-8 is filled with more popular notions, folklore attending the occupations of root-cutting and drug-pandering.[41] These sources of information fit Theophrastus's ideas of gathering empirical knowledge, and he was interested "in things which are called fairy-tales by earlier thinkers."[42] He labeled these ideas as probably less than reliable, but included them because they had yet to be tested and apparently were useful to the *rhizotomoi* and *pharmacopōlai* in their work. That "use" can be placed within the doctrines of sympathy, which seemed to gain popularity in the fourth century B.C.,[43] and which moved the perception of *pharmaka* back into the pesudo-divine context they had had in Homer.[44] If Edelstein's contention is correct, *pharmaka* had been divested of their "magical" and "divine" nature in the Greek writings from c. 700 B.C. to the time of Theophrastus.[45] The new age of wide-ranging military ventures, and of new knowledge from the "far" East, was an age that seemed more willing to attribute multiple meanings and

38. *Cf.* Rufus in Oribasius, VII, 26.125, and Archigenes, Ibid., VIII, 2.30.

39. *HP*, IX, 8.3. Cf. IV, 153 (Θάψια). Dioscorides, IV, 153.2, notes that one had best dig it up only when there is no wind, because the root gives blisters. Cf. Pseudo-Aristotle, *Problems*, I, 41 [864a6].

40. *HP*, IX, 8.4: φάσιν.

41. *HP*, IX, 8.5-8.

42. Ludwig Edelstein, "Greek Medicine in Its Relation to Religion and Magic," *Bull. Hist. Med.*, *5* (1937), 201-246; reprinted in Owsei and C. Lilian Temkin, eds., *Ancient Medicine: Selected Papers of Ludwig Edelstein* (Baltimore: Johns Hopkins Press, 1967), pp. 205-246.

43. Pseudo-Aristotle, *Problems*, 886a24. Theophrastus, *On Odors*, 63.

44. *Odyssey*, IV, 230, among many references.

45. Edelstein, "Greek Medicine," pp. 233-235.

powers to *pharmaka*. Much later, Galen would reflect this change,[46] as does Pseudo-Aristotle in *Problems*,[47] probably set down in the generation of Theophrastus. Thus Theophrastus's herbs emerge from a wider context than simply the observations of Diocles: the root-cutters and drug-sellers are assumed to have information that would help provide full description and analysis of the plants. Their medical properties seem not to have been appreciated before Diocles and Theophrastus (the Hippocratic tradition avoids any "sympathetic" description of plants and derived drugs),[48] and *Historia Plantarum* IX is exactly the place one would expect to find plant medicinals.

Mandragoras (Mandrake [*Atropa mandragora* L., or *M. officinalis* L.; U.S. sp. *Podophyllum peltatum* L.])[49] is the first herb on Theophrastus's list (IX, 9.1). Its leaf is to be mixed with barley meal to make a poultice, and is beneficial on wounds. The root, scraped and soaked in vinegar, is deemed useful for erysipelas; also the root(?) is used as a remedy for gout, as a sleep inducer, for "potions" (*philtra*), and is given in "wine or vinegar." One prepares the root by cutting it into little balls (like radishes),[50] stringing them over new wine, and then hanging them over a fire to be smoked.[51]

Mandragoras is in Dioscorides,[52] Galen,[53] and Oribasius,[54] but not in Nicander. Similar to Theophrastus's "sleep inducer" is Galen's "pain killer."[55] The active principles in mandrake are podophyllotoxin, as well as picropodophyllin, and several peltatins. Medically, the effect of mandrake is quite similar to that of stramonium (*Datura stramonium* L.) and belladonna (*Atropa belladonna* L.), and produces lethargy. In modern times, mandrake is employed as an antispasmodic for dogs in veterinary practice, but is no longer recommended as a cathartic in

46. John Scarborough, *Roman Medicine* (London: Thames and Hudson, 1969), pp. 135 and 216, nn. 78-83 (astrology).

47. See note 43, above.

48. Edelstein, "Greek Medicine," p. 234.

49. It is unlikely that this is the Indian podophyllum (*Podophyllum emodi* Wall.), from the Himalaya Mountains and Kashmir.

50. Cf. *HP*, IX, 12.1.

51. Cf. Dioscorides, III, 7; IV, 75; and V, 71. *HP*, IX, 8.8.

52. Esp. IV, 75.

53. XI, 751 and 767, among many references.

54. Oribasius, XI, M.3 (cf. Dioscorides, IV, 75); J. Raeder, ed., *Oribasii Collectionum Medicarum Reliquiae*, 4 vols. (Leipzig: Teubner, 1928-1933 [*Corpus Medicorum Graecorum*, VI, 1, 2]), II, 119-120 (= XI, M.3).

55. Galen, X, 816 (= *Method of Medicine*, XII, 1): ἐν τοῖς καλουμένοις ἀκινδύνοις φαρμάκοις, among which is listed μανδραγόρου ῥίζης.

general medicine. Theophrastus's sources knew that the pain from gout would be alleviated with a mandrake "potion," but any beneficial effects in the treatment of erysipelas would come from the mild antibiotic action of wine or vinegar (if applied externally) against Group A hemolytic streptococci. Possibly the mandrake drink would have helped victims of erysipelas who had developed secondary symptoms.

Next comes *helleboros* (IX, 9.2), with a very cryptic summary that says simply "both the root and fruit are useful" as a purge. Shortly (IX, 10.1-3), Theophrastus adds a little more about *helleboros*, noting that there are two kinds, black and white; black is fatal to horses; white is eaten by sheep and thereby purged; white *helleboros* grows in the vineyards of Elea, and is used there to make a very diuretic wine. In IX, 14.1-4, we read that *Helleboros* (its "prepared" name is *sēsamōdē*)[56] keeps a long time, almost infinitely without losing its effectiveness, and in IX, 8.4, *helleboros* appears as part of the general description of "root-cutting."[57] By contrast, Diocorides has a lengthy description,[58] replete with superstitions, and Galen mentions *helleboros* as emerging from the Hippocratic writings,[59] as well as from the books of Archigenes.[60] It is curious that Theophrastus gives such short shrift to *helleboros*, unless he intends not to speak at length about those plants known to be deleterious. A related oddity is Nicander's omission of *helleboros* in both the *Theriaca* and *Alexipharmaca*; again this may be due to the influence of Diocles' original work, employed by Apollodorus, and in turn purloined by Nicander.[61]

Black *helleboros* is *Helleboros niger* L., and white *helleboros* is *Veratrum album* L. (U.S. sp. *Veratrum viride*, Ait., "green hellobore"). An alkaloid, cevadine, is contained in the root, which is also part of what is known as veratrine mixture, gained from the seeds of *Schoenocaulon officinale* (Lindl.) A. Gray. No longer used as an anodyne counterirritant, cevadine extract (as part of veratrine) is used in veterinary

56. Dioscorides, IV, 162.1: *καὶ ἐν Ἀντικύρᾳ σησαμοειδές, χρώμενοι πρὸς τὰς καθάρσεις αὐτῷ.*

57. See *HP*, IV, 5.1; VI, 2.9, for description; *De Causis Plantarum* (ed. Wimmer), VI, 13.4, for general qualities. See also *HP*, IX, 15.5 (Arcadia).

58. Dioscorides, IV, 148; 149; and 162. Virgil, *Georgics*, III, 451. See Elfriede Abbe, *The Plants of Virgil's Georgics* (Ithaca: Cornell University Press, 1965), pp. 49-50.

59. Galen, XI, 874 = *Blendings and Dynameis of Simple Medicines*, VI, 5.9.

60. Galen, XVI, 124 (Archigenes); XIV, 761 (antidote for hellebore); XIX, 739 and 744 ("black" hellebore); XIX, 744 ("white" hellebore); among many references.

61. Scarborough, "Nicander's Toxicology," pp. 3-23.

medicine as an emetic for pigs and cattle. Theophrastus does not specify what he means by "purge," but an administration of hellebore would promote heavy vomiting. Theophrastus's sources knew the dangers of hellebore, illustrated in an anecdote about a drug-vendor and a shepherd (IX, 17.1). A *Pharmakopōlēs* was impressing many by his ability to eat without harm "one or two roots" of hellebore, when a local shepherd came up and ate *all* the drug-vendor's supply without ill-effect. One could, therefore, build up a resistance to hellebore (any shepherd knew this), and the incident destroyed the drug-seller's reputation. Furthermore, Theophrastus adds that Thrasyas (otherwise unknown) could consume hellebore without harm, and that a certain Eudemus of Chios could drink hellebore and survive, because he had an "aid."[62] This turns out to be pumice (*kissēris*). It appears that toxicology had not emerged as a separate series of observations, except incidentally.[63] It is clear, however,that Theophrastus was aware that hellebore was quite toxic.

Following the clipped notice about hellebore, the same section (IX, 9.1) has a listing of uses for *panakes* (probably "all heal"). This passage seems badly corrupted, and any firm identification of the plant must await a critical text.[64] Perhaps of the *Valerium* spp., or *Ferulago*, the fruit was useful in treating miscarriage, as well as micturation problems (*tas dysourias*). Other references in Dioscorides (I, 6), Rufus in Oribasius (VIII, 24.6), and the Hippocratic *Aphorisms* (III, 31) do not help key the plant, because other suggestions are made for urination problems. The juice of the *panakes* also is useful in treating miscarriage, for sprains, the voice, and "for the ears." The root is beneficial for other problems of women (unspecified),[65] and for flatulence in beasts of burden.[66] Lastly, *panakes* is useful in making perfume (as in *Historia Plantarium*, IX, 7.2). One might hope that the further listing of *panakes* in IX, 11.1-4 would help to key either the full list of four "kinds" or the specific species. The *panakes* in IX, 9.2, is now called "Syrian,"

62. *HP*, IX, 17.3: ἡ βοήθεια.

63. Scarborough, "Nicander's Toxicology," pp. 3-7.

64. Sir Arthur Hort, ed. and trans., *Theophrastus: Enquiry into Plants*, 2 vols. (London: Heinemann, 1916 [Loeb Classical Library]), II, 468, states *Ferulago galbanifera*.

65. Πάνακες in the Hippocratic *corpus* (ed. E. Littré), VIII, 387, is recommended in treatment for displacement of the uterus; Littré thinks the plant is *Echinophora tenuifolia*. Soranus, *Gynecology* (ed. J. Ilberg [Leipzig: Teubner, 1927; *Corpus Medicorum Graecorum*, IV]), I, 19.62: πάνακος ῥίζης is a contraceptive.

66. This seems to be an echo of Aristotle, *Historia Animalium*, 604a12: πρὸς ὑποζυγίων φύσας.

and in IX, 11.1-3, we get three more "kinds:" "Chaeronean," *panakes* of Asclepius, and *panakes* of Heracles. "Chaeronean" may be from the *Inula* spp., and Theophrastus writes that this plant is most effective against the bites of spiders, snakes, and other reptiles. One gives "Chaeronean" in the following ways: in wine, in olive oil (smearing the wound), in a plaster, in vinegar, and with honey (for tumors: *phymatōn*). Nicander, *Theriaca*, 130, 223, and 826, and Oppian, *Cynegetica*, III, 439, allude to the snakebite, but the type of *panakes* (Nicander, *Theriaca*, 565) is quite different. The third on Theophrastus's list of *panakes* is the *panakes* of Asclepius (IX, 11.2), which appears in Nicander, *Theriaca*, 685, as *panakes Phlegyeion.*[67] Perhaps this is one of the *Ferula* spp., and Theophrastus says to scrape the leaf and stem (which taste salty: *halykōdē*) into an unnamed drink for benefit against snakebite. There are other uses: mix it with honey for disorders of the spleen, when blood accumulates around it; pound it up (root? leaf?) with olive oil, and anoint the head to cure headache; take scrapings in wine for stomachache; sprinkle it on a "wet" or "running" wound (*tōn helkōn tōn men hygrōn*) in hot wine (wash the wound first); apply a plaster of it, soaked in wine, for dry wounds. Again the major benefit would come from the lightly antibiotic qualities of wine, or from a similar effect in the honey mixture.[68]

The fourth *panakes* (*Historia Plantarum*, IX, 11.3) can be keyed, thanks to a reference in Dioscorides (III, 48.1). This is the *panakes* of Heracles, from which – so Dioscorides tells us – is extracted *opopanax*. Opopanax is a fetid gum resin, obtained from the roots of *opopanax Chironium* (L.) Koch, a yellow-flowered umbelliferous plant that resembles the parsnip;[69] opopanax was formerly used in perfumes and soaps.

67. ἄγρει καὶ πάνακες φλεγυήιον, ὅ ῥά τε πρῶτος / Παιήων Μέλανος ποταμοῦ παρὰ χείλος ἄμεβξεν. A. S. F. Gow and A. F. Scholfield, *Nicander* (Cambridge: Cambridge University Press, 1953), p. 234, identify the plant as *Echinophora tenuifolia*. See Dioscorides, III, 49.

68. On wine as an antiseptic, see Guido Majno, *The Healing Hand: Man and Wound in the Ancient World* (Cambridge, Mass.: Harvard University Press, 1975), p. 187: "The antiseptic power of wine is no myth ... Recent studies ... pin down the mechanism to the anthocyanes, a subgroup in the large group of polyphenols present in wine." Majno gives bibliographical data in nn. 255-260, p. 498. On honey, see ibid., p. 117: "Honey is antibacterial for several reasons. The most obvious is a simple concentration effect: being extremely hypertonic, it draws water from the bacterial cells, causing them to shrivel and die." References are in nn. 184-197, p. 484.

69. Cf. Celsus, V, 18.5, and Galen, XIII, 341 (recipe with opopanax). See Scarborough, "Asclepiades," p. 53.

Theophrastus says that this particular kind of *panakes* tastes bitter and smells like frankincense. It has two uses, plus an unusual third: first, one can drink it with wine to soothe stomach pains; second, mixed with honey, it helps heal dry wounds, and wet ones are helped by the substance alone. The third use not only is unusual, but proves also that *Historia Plantarum* IX stands solidly within Aristotelianism. Heracles's *panakes* is also beneficial for epilepsy, but it must be mixed "with the curd of a seal (*phōkēs pitua*)," in the proportion of one to four. *Pitua* = *tamisos*,[70] which means that Theophrastus is recommending the rennet from a seal for epilepsy. There are parallels in other authors: Nicander, *Theriaca*, 577, recommends the curd (*tamisos*) of a rabbit or stag as part of an antidote for snakebite, and Nicander, *Alexipharmaca*, 68, uses *puetia* instead of *tamisos*; Dioscorides, II, 75, recommends *pitua* of a rabbit, along with the curd of horses, deer, and other animals – the best being that of a seal – for epilepsy. Not much of this would make much sense, were it not for the scholiast's remarks on *Theriaca*, 577.[71] High-quality cheese was made with curds of various animals (used as a coagulant), and cheese fanciers could tell exactly what animal by the odor. Slightly useful against snake venom (the calcium),[72] *tamisos/pitua* would have small benefit for victims of the "sacred disease."[73]

The choice of a seal by Theophrastus is significant. It is the only animal he mentions in *Historia Plantarum* IX, and the seal was a particularly puzzling animal to Aristotle before him: Aristotle had dissected seals and bats to see why they were "merely quadrupeds badly formed."[74] He had determined that seal kidneys resembled those of an ox, that seals had no gall bladder,[75] did not breathe sea water, bore their young

70. Erotian, *s.v.* τάμισος.

71. *Scholia on Theriaca*, 577 (ed. A. Crugnola [Milan: Instituto Editoriale Cisalpino, 1971], p. 220). Also *Scholia on Theocritus*, VII, 16 (ed. F. Dübner [Paris: Didot, 1870(?)], p. 52): τάμισος δὲ ἡ πυτία εἴρηται παρὰ τὸ θαμίζειν, ὅ ἐστι πυκνοῦν τὸ γάλα περὶ αὐτὸ στρεφόμενον. ἢ παρὰ τὸ ταμείων ἀξιοῦσθαι διὰ τὴν χῆσιν.

72. G. L. McGrew and B. D. Johnson, "*In Vivo* Effects of Selected *Crotalus* Venoms on Serum Magnesium and Calcium," in A. de Vries and E. Kochva, eds., *Toxins of Animal and Plant Origin* (New York: Gordon and Breach, 1973), III, 1039-1054. E. R. Trethewie, "The Pharmacology and Toxicology of the Venoms of Snakes of Australia and Oceania," in W. Bücherl et. al., eds., *Venomous Animals and Their Venoms* (New York: Academic Press, 1971), II, 79-101, esp. 88. Scarborough, "Nicander's Toxicology," n. 135.

73. Owsei Temkin, *The Falling Sickness*, 2nd ed. (Baltimore: Johns Hopkins Press, 1971), pp. 22, 79.

74. Aristotle, *Progression of Animals*, XIX, 10 (714b10).

75. Aristotle, *Parts of Animals*, III, 9 (671b4-6), IV, 2 (676b28-30).

alive, produced a chorion, had bones like cartilage,[76] and had no external ears.[77] Last, Aristotle said that seals vomited up their curds when they were caught, and the *pitua* was medically useful for epileptics.[78] Theophrastus picked the seal as that animal which would give beneficial curd, most probably because Aristotle, his mentor, attached such importance to it in his study of animals. Likewise, this choice appears in Dioscorides, a fact which may be another instance of the long-range impact of Diocles.[79] At the very least, *Historia Plantarum* IX, 11.3, indicates the heritage of Aristotle, easily seen in *Progression of Animals, Parts of Animals*, and other works. The species is the monk seal (*Monachus monachus* Herm.), the same species that appears in *Odyssey*, IV, 404 and 451. Now a rarity, the monk seal was quite common during classical antiquity in the Mediterranean and Black Seas; it presently occurs only around Rhodes, Corsica, and Cape Caliacra (on the coast of Bulgaria).[80]

Returning to ordinary herbs, Theophrastus quickly lists *kyklaminos* (*Historia Plantarum*, IX, 9.3), *sikuos ho agrios* (IX, 9.4), and *chamaidrys* (IX, 9.5). *Kyklaminos* is the cyclamen, or "sow bread" (*Cyclamen europaeum* L.), from which is extracted cyclamin (triacetyloleandromycin), employed in modern medicine as an antibacterial, emetic, purgative, and hemolytic agent. Generally, cyclamen is a low, primulaceous herb in the *Cyclamen* spp. with tuberous rootstocks and nodding white, purple, pink, or red flowers with reflexed petals. Having written (VII, 9.4) that the root has bark, Theophrastus says (IX, 9.3) that the root is beneficial for running wounds, and mixed with honey is a good wound dressing.[81] Indeed, with the mild antibiotic character of honey added to the cyclamen, this dressing would be quite beneficial. Also the root

76. Aristotle, *Historia Animalium*, VI, 11 (566b27-567a15).

77. Aristotle, *Generation of Animals*, V, 2.24-29 (781b24-29); same as *Parts of Animals*, II, 12.21-24 (657a21-24).

78. Pseudo-Aristotle, *Marvelous Things Heard*, 77 (835b32-34).

79. Dioscorides, II, 75; see notes 9 and 17, above.

80. Two other species of the monk seal—rare—occur in the West Indies (*M. tropicalis*) and Hawaii (*M. schauinslandi*). Otto Keller, *Die antike Tierwelt*, 2 vols. (Leipzig, 1909; reprinted Hildesheim, 1963), I, 407-408, collects a few references. See also B. Mursalogu, "Occurrence of the Monk Seal on the Turkish Coasts," *J. Mammology, 45* (1964), 316-317; A. van Wijngaarden, "The Mediterranean Monk Seal," *Oryx, 6* (1962), 270-273; Judith E. King, "The Monk Seals (Genus *Monachus*)," *Bull. Brit. Mus.* (Nat. Hist.) *Zool., 5* (1956), 201-256. There is a summary in Noel Simon and Paul Geroudet, *Last Survivors* (New York: World Publishing Co., 1970), pp. 258-262.

81. See note 68, above.

can be used as a pessary for women, a reference that forms part of a suppository recipe in Soranus, *Gynecology*, III, 6.32 (Ilberg). The root is good as a charm to promote rapid childbirth; the charm is in little balls, made from the ashes of the root steeped in wine.[82] The juice of the cyclamen is good for "head purges" poured in (the nostrils?) mixed with honey.[83]

Sikuos ho agrios is labeled "squirting" or "wild" cucumber (*Ecballium elaterium* L.),[84] and Theophrastus says that the root is used to treat white leprosy and mange in sheep; the juice extracted was called *elatērion* ("the driver").[85] Related species, like the colocynth (*Citrullus colocynthis* Schrad.) contain albuminoids, pectin, and colocynthin, formerly used as a drastic purgative, and as a purgative for dogs and pigs in veterinary medicine. The Greek *elatērion* states what the extract can do to the bowels.

Chamaidrys is germander (or English treacle, or wood garlic: *Teucrium scordium* L.), which Theophrastus says is used for wounds, fractures, and wounds that seem to be spreading (the leaves, pounded up in olive oil); the fruit functions as a bile purge, and is beneficial for treating ulcers of the eye.[86] The fresh herb has a garlicky odor and a sharp, bitter taste. It contains tannin, as well as scordein and an oil. Formerly employed as a sudorific, scordein (scordium) was once believed to be an antidote for poisons, a tradition that appears in Pliny[87] and Dioscorides.[88]

Two kinds of *strychnoi* follow the *panakē*. One type induces sleep (*hypnōdēs*), while the second variety is called *manikos*. For the sleep

82. Cf. Pliny, *Natural History*, XXIII, 63, with *HP*, IX, 9.4.

83. Cf. Dioscorides, II, 164, and Pliny, *Natural History*, XXV, 133, and XXVI, 149.

84. By Hort, *Theophrastus*, II, 476, and Gow and Scholfield, *Nicander*, p. 235. Cf. Dioscorides, IV, 150, and Pliny, *Natural History*, XX, 3.

85. See also *HP*, IX, 14.1 and 2.

86. *HP*, IX, 9.5. Cf. *HP*, VII, 6.2, and Dioscorides, III, 98.

87. Pliny, XXIV, 130-131 (*Chamaedys herba*), XXV, 63, 100, and 127 (*scordion* = *scordotis*).

88. Dioscorides, III, 97, and 98. Pliny (note 87, above) may reflect the confusion of names in his Greek sources. In *HP*, IX, 9.5, and Dioscorides, III, 98, one meets χαμαίδρυς; in Dioscorides, III, 97, χαμαίδρυς = τεύκριον, and in Dioscorides, III, 111, χαμαίδρυς = σκόρδιον. The confusion is also mirrored in Bernhard Langkavel, *Botanik der spaeteren Griechen* (Berlin, 1866; reprinted Amsterdam: Hakkert, 1964), p. 59. Modern nomenclature makes the "wall germander" and the "water germander" into one species, going back, so it seems, to Theophrastus, who has only χαμαίδρυς. Theophrastus's σκόροδον (σκόρδον) is always garlic.

inducer, one soaks the root in wine, after the bark of the root has been bruised, and then drinks the wine thus treated to bring on drowsiness. The plant here in IX, 11.5, also appears in VII, 15.4, and is the famous deadly nightshade (*Atropa belladonna* L.),[89] or the belladonna leaf. Quite familiar to modern pharmacologists, the extract contains atropine, hyoscyamine, scopolamine, asparagine, choline, chrysatropic acid, atroscine, leucatropic acid, and phytosterol. Modern physicians will sometimes use belladonna as an anticholinergic, and veterinarians employ it to suppress the symptoms of heaves; its former broad veterinary use as an antispasmodic in colic, tetanus, cough, bronchitis, and dyspnea has been supplanted by more uniformly acting drugs. Theophrastus's (and Nicander's) "sleep inducer" would indeed promote relaxation, if the dose were as diluted as *Historia Plantarum* IX, 11.5, suggests. Unfortunately, there are numerous side effects – some quite serious – if the dose is anything other than minute. Such effects would be quite similar to those observed with atropine sulfate, which include xerostomia, brachycardia, mydiasis, blurred vision, and urinary retention.[90]

Stryknos manikos causes insanity (IX, 11.6). This is the thorn apple (*Datura stramonium* L.), again quite familiar in modern pharmacology.[91] The leaves contain 0.25-0.45 percent alkaloids (atropine, hyoscyamine, and scopalamine), plus some proteins and albumin; the seeds have the same constituents, but in lesser quantity. In modern medicine, the extract is called stramonium, and is used as an anticholinergic and antiasthmatic agent, as well as in the treatment of Parkinson's disease. Since 1967, however, the drug of choice has been levodopa. Theophrastus's *manikos* has four basic uses: one drachma improves one's mood; two drachmae cause temporary insanity and delusions; three drachmae cause permanent insanity (here mixed with *opon kentauriou* [*Centaurea salonitana* L. ?]); and four drachmae kill a man.[92] In many

89. Nicander, *Theriaca*, 74 and 878: simply *στρύχνον*, which is probably *στρύχνον ὑπνωτικοῦ*.

90. Dioscorides, IV, 72.1-2: *στρύχνον ὑπνωτικόν*. In IV, 72.2, one reads *ταὐτης ὁ φλοὸς τῆς ῥίζης οἴνῳ ποθεὶς δραχμῆς μιᾶς ὀλκὴ ὑπνωτικήν*. Dioscorides notes that the effect (*δύναμιν*) of the juice is less than that of the poppy (*τῆς μήκωνος*). Galen, XII, 145-146 (*περὶ τρύχνουἢ στρύχνου*), also picks up the traditional description, except that the account seems a conflation of *HP*, IX, 11.5 and 6; Galen's *στρύχνον* includes both *στρύχνον ὑπνωτικόν* and *στρύχνον μανικόν*, given separate entries by Theophrastus and Dioscorides.

91. A. F. Blakeslee's *The Genus "Datura"* (New York: Ronald Press, 1959) is a standard reference.

92. The *drachmē* = 52.8 grains = 3.41 grams; the *oxybaphon* = 1/8 pint = 0.06 liters. Scarborough, "Nicander's Toxicology," pp. 6 and 11 with nn. 56 and 115a.

respects, IX, 11.6, is a forecast of the "herbals affecting the mind" found in IX, 18.3-11, followed by reemphasis on the fact that *manikos* causes madness in IX, 19.1. Dioscorides, IV, 73.2, has roughly the same measures for the effects of *manikos*: one drachma gives pleasant visions (or fantasies); two drachmae make one "out of his head" for three days;[93] and four drachmae kill. Dioscorides, unlike Theophrastus, includes an antidote (*antipharmakon*), which is *melikraton*, the honey-water drink seen in *Historia Plantarum*, IX, 11.2.[94]

Three types of spurge (*tithymalloi*) are in *Historia Plantarum*, IX, 11.7-9. These are from the numerous species in the genus *Euphorbia*, which have milky juice and flowers with no petals or sepals. *E. hirta* L. and *E. pilulifera* L. are both very common in India, and possibly some information on these two species came to Theophrastus as a result of Alexander's campaigns there. *E. peplus* L. and *E. paralias* L. are two other candidates for the list. Dioscorides, IV, 164.1-9, has seven varieties. Hort and his sources offer the following nomenclature: *tithymallos* (IX, 11.7) = *E. peplus; tithymallos ho arrēn* (IX, 11.8) = *E. Sibthorpii* (Wimmer offers *E. Characias* [p. 546]); *tithymallos ho myrtitēs* (IX, 11.9) = *E. Mysinites* (same as Wimmer, p. 546). Comparative readings from Dioscorides, IV, 164, and Pliny, *Natural History*, XXVI, 62-66, lead to similar, imprecise conclusions. Whatever the exact species, all the *Euphorbia* contain several resins and an unstable glucoside, widely used in medicine until quite recently in the treatment of asthma and bronchitis. Theophrastus's account says that the dried fruit is given in an unspecified drink (presumably wine), the juice from the whole plant functions as a bowel purge, and the fruit is called a "nut" (*kaletai kauron*).[95] There are two methods of administration: dry the *kauron*, clean it, wash it in water again, then give it to drink mixed with two parts of "black poppy," which all together equal one *oxybaphos*.[96] This concoction is particularly good as a "phlegm-purger from the bowels." The second method involves grinding up the *kauron* in sweet wine, or giving the nut with dried sesame (*Sesamum indicum* L.) to be chewed

93. δύο δὲ δραχμαὶ ποθεῖσαι ἐξιστάνουσιν ἀρχι τριῶν ἡμερῶν. In IV, 73.1, Dioscorides gives the other names for μανικός: πέρσειον, περισσόν, ἄνυδρον, πεντόδρυον, θρύον, and ὀρθόγυιον (ἐκαλεσαν). In Pliny, XXI, 177-179, the name seems to be derived from ἐρυθρόν.

94. This is probably the honey-water drink, as in Oribasius (quoting Antyllus), V, 29.7, and V, 14.1 (quoting Galen), contrasted with the honey-milk drink, offered in libation to the powers of the underworld (*Odyssey*, X, 519).

95. Cf. *De Causis Plantarum*, IV, 6.9.

96. See note 92, above.

up. No result is specified, but probably the bowels are purged again.

In IX, 11.10 and 11, occur two varieties of *libanōtis* (with fruit: *Karpimos*; and lacking fruit: *akarpos*). These two types are related to the well-known rosemary (*Rosmarinus officinalis* L.), long employed in the manufacture of perfumes, Eau de Cologne, and toilet soap.[97] By comparing IX, 11.10, with Dioscorides, III, 74.1, and Galen, XII, 60 (and the odd *libanōtis kachryphoros* of Nicander, *Theriaca*, 850), one is reasonably assured that Theophrastus's *libanōtis karpimos* is the rosemary frankincense, *Lecokia cretica* L.; *Libanōtis hē akarpos* is probably the sterile rosemary, *R. sterile*, or *Lactuca graeca*, as in Dioscorides, III, 74.4. According to Theophrastus, the root of the *karpimos* is beneficial for wounds and for "women's matters,"[98] given in dry black wine, and for difficulty in urination (strangury), for ophthalmia and conjunctivitis,[99] and to promote milk in women. *Akarpos* (IX, 11.11) has a root that purges "both ways: up and down," with the upper part of the root for vomiting, the lower part for the bowels. Also *akarpos* functioned as the ancient equivalent of paradichlorobenzene crystals: it kept moths from eating one's clothes. *R. officinalis* contains about 1 percent oil, resin, and the bitter principle (flowers), and oil and tannin (leaves). The leaves were used in medical practice as an emmenagogue, and the tannin would have beneficial effect, especially on open wounds.

Two kinds of *chamaileōn* follow (*cf.* VI, 4.3). *Chamaileōn ho leukos* (IX, 12.1) is the white pine thistle (*Atractylis gummifera* L.). Theophrastus says that the root is to be cooked, chopped up, and eaten like radishes for treatment of diarrhea. For treatment of flatworms,[100] the

97. A good, short summary is in Albert F. Hill, *Economic Botany* (New York: McGraw-Hill, 1952), pp. 185-186.

98. καὶ πρὸς τὰ γυναικεῖα. Soranus (ed. Ilberg), II, 24.51, suggests ὁ λιβανωτός (the real frankincense) in the treatment περὶ ἄφθης (thrush).

99. πρὸς τὰς στραγγουρίας καὶ πρὸς τὰ ὦτα καὶ ἄργεμα καὶ πρὸς ὀφαλμίας. "For the ears" may be similar to the following "for the eyes." ἄργεμα are rather curious. Pollux, *Onomasticon* (ed. E. Bethe [Stuttgart: Teubner, 1966; reprint of 1900-1937 ed.]), II, 65: ἄργεμος[ον] = λεύκωμα. In Dioscorides, III, 84, and Galen, XIV, 775, and Aetius, VII, 39, this means a "spot" in the eye, a thickening of the cornea, an anterior synechia causing a dense white cicatrix of the cornea. Unless Theophrastus or his source is prescribing a kind of pleasant-smelling eye wash (or salve) made from the rosemary frankincense, the text makes little sense.

100. This may be an echo of Aristotle's observations in *Historia Animalium*, V, 19 esp. 551a8-14 and 551b27-30. The flatworm probably is one of the cyclophyllidean tapeworms, common as parasites in man.

victim was to eat some raisins first, then to drink an *oxybaphon*[101] of the scraped root in wine. *Leukos* is fatal to dogs: one mixes it in a meal paste with oil and water to kill them. Likewise, *Leukos* is used to kill pigs: one mixes it with a spurge, *rhaphanos he oreia* (probably *Euphorbia Apios* L.).[102] *Leukos* is useful in sweet wine for unspecified complaints of women.[103] Last, a little folk tradition peeps through in the account of *leukos*: if a sick man is washed with *leukos* (in wine) for three days – and lives – he will recover.[104]

Atractylis gummifera L. yields, by hydrolysis, the poisonous glucoside atractylic acid, in the form of its potassium salt. A highly toxic substance, atractylic acid (or atractyligenin) produces convulsions of a hypoglycemic nature, like strychnine. Atractylic acid would be quite poisonous, but could function as a circulatory stimulant in the manner of a bitter tonic. The plant might be effective against tapeworms, but the side effects would not warrent its use in heavy doses. It appears that the folk traditions have a clearer notion of *A. gummifera.*[105]

Chamaileōn ho melas is *Cardopatium corymbosum* L., the dark pine thistle. Theophrastus (*Historia Plantarum*, IX, 12.2) says that this is beneficial against leprosy, if mixed with vinegar; likewise, a plaster can be made, also useful against leprosy. *Melas* is also fatal to dogs – or ticks on a dog.[106] Dioscorides, III, 9.2, more or less repeats the notion that vinegar and *melas* cure leprosy, and adds that "passed through a hollow quill, [they] will break up a bad tooth." The substance may have had some use as a mild analgesic for toothache, but it is ineffective against leprosy. Until recently, the ethyl asters of some acids in chaulmoogra oil (from the Burmese tree, *Hydnocarpus Kurzii* [the seeds within the velvety fruit]) provided an effective, if painful, chemotherapy for leprosy. Modern drugs of choice are among the sulfones, especially dapsone (4,4'-sulfonyldianiline).

Three kinds of *mēkōnes* constitute the listings in *Historia Plantarum*, IX, 12.3-5. All appear to be wild poppies, none of which is the famous

101. See note 92, above.

102. Cf. Dioscorides, IV, 175 (which Wellmann [ed., *Materia Medica*, II, 324] asserts comes from Diocles, owing to the similarity to Theophrastus, *HP*, IX, 9.6).

103. Pliny, XXII, 21.45-47, picks up this tradition among others; XXII, 45: "Hac mastiche utuntur mulieres." There is no trace in Soranus.

104. One is reminded of Cato, *On Agriculture*, 157.10 (where Cato is extolling the medical virtues of cabbage): "Item pueros pusillos si laves eo lotio, numquam debiles fient." Scarborough, *Roman Medicine*, pp. 17-21 (on Cato).

105. Cf. Nicander, *Theriaca*, 656, and Dawkins, "Greek Names for Plants," p. 5.

106. Hort, Theophrastus, II, 279, n. 7: κύνας may be κυνοραϊστας, dog-ticks, as conjectured by Reinesius from Pliny's *ricinos canum.*

opium poppy (*Papaver somniferum* L., or *P. album* Mill.). *Mēkōn hē keratitis* (IX, 12.3) is the horned poppy (*Glaucium flavum* L. [Hort gives var. Serpierii]), the fruit of which "has the power to clean out the bowels," and the leaf removes *argema* from sheep.[107] *Mēkōn hē rhoias* (IX, 12.4) is called the corn poppy in North America (*Papaver rhoeas* L.; Hort offers *P. hybridum*), and is a bowel purge. *Mēkōn hē Hrakleia*, "frothy poppy" (IX, 12.5; *Silene venosa*, so Hort thinks), cleans as an emetic, and is employed in mead as a treatment for epileptics.[108]

There is a curious absence in this section: the opium poppy, which appears only once in the entire *Historia Plantarum*, and that reference is a very brief notice in I, 12.2, in a section on saps. The fig and the poppy have milky saps. And that is all. Even this one citation may be in doubt, because the Greek text is quite corrupted.[109] Given the fame and widespread employment of *Papaver somniferum* L. in classical antiquity (references begin with Homer, *Iliad*, VIII, 306), there may be good reason why Theophrastus declined to include it in his herbs and herbals. Almost all other sources in Greek and Roman pharmacy and medicine include the opium poppy, and the list is impressive: Nicander,[110] Theocritus,[111] Dioscorides,[112]

107. See note 99, above.

108. Cf. Dioscorides, IV, 64, and Pliny, XX, 205-206; Dioscorides, IV, 64, and Pliny, XIX, 167-169; and Dioscorides, IV, 66, and Pliny, XX, 207.

109. Hort, *Theophrastus*, I, 86, n. 4.

110. *Theriaca*, 946; *Alexipharmaca*, 433-440 (in list of poisons); Athenaeus, XV, 683f-684a (from Nicander, *Geo* ·-*a*; frag. 74 in Gow and Scholfield). Nicander has *P. rhoeas* in *Theriaca*, 851, and *Glaucium flavum* in *Theriaca*, 852.

111. Theocritus, *Idylls*, VII, 157; XI, 57-58. *Scholia on Theocritus: Idylls* (ed. F. Dübner), III, 29: τηλέφιον δὲ ἐστι τὸ φύλλον τῆς μήκωνος. A. S. F. Gow, *Theocritus*, 2 vols. (Cambridge: Cambridge University Press, 1952), II, 70, notes that the scholiast seems uncertain, because a second reading appears.

112. Dioscorides, IV, 64.1-7, is an extended account, beginning with the definite distinction of cultivation: μήκωνος · ἡ μὲν τίς ἐστιν ἥμερος καὶ κηπευτή. Dioscorides' authorities have warnings: Erasistratus (quoted by Diagoras) thought the use of the opium poppy was inadvisable for eye or ear problems, because it dulled vision and caused sleep (IV, 64.6); Andreas is quoted (ibid.) as saying that it causes blindness; Mnesidemus (ibid.) thought the opium poppy had two uses: for the odor and as a sleep inducer. The odor and bright color of the opium poppy figure in numerous similes in Greek and Roman poetry, as indicated by the references in Saara Lilja, *The Treatment of Odours in the Poetry of Antiquity* (Helsinki: Societas Scientiarum Fennica [*Commentationes Humanarum Litterarum*, 49], 1972), pp. 193-195. Dioscorides, IV, 64.5, also remarks that there are some "fake" opium products, suggesting (1) great demand for the genuine article and (2) willing customers for the adulterated juice. Earlier (IV, 64.3), he has written πλείων δὲ ποθεὶς βαπτίζει ⟨ὕπνῳ⟩ ληθαργωδῶς καὶ ἀναιρεῖ

Celsus,[113] Pliny,[114] and Galen,[115] among many. Theophrastus's silence, however, may have a simple explanation, because the juice of *P. rhoeas* does have a small amount of opium, and would be a mild narcotic and anodyne. In IX, 16.8, *mēkōn* is coupled with *kōneion*, suggesting a hemlock poppy, another plant altogether. It may be that the "cultivated" poppy was not common in Theophrastus's time, and that he would not have recognized the substance as either more useful or more dangerous than other "saps." Some support for this conclusion lies in the treatment that Celsus gives to the poppy: in *De medicina*, V, 27.12B-C, Celsus does not include the poppy in his list of poisons, which suggests he knew only of a mild variety; he does, however, recommend the juice of *papaver* (probably *P. rhoeas*) as an internal medicine to induce sleep and relieve pain, and he advises its external application to alleviate pains in the parts.[116] Theophrastus's notice of

113. See note 116, below.

114. Pliny has a great number of vague references to *papaver*. The following passages are quite definitely about the opium poppy: XVIII, 229 ("visque somnifera etiam sativo"); XIX, 168-169 (beginning with "papaveris sativi tria genera"); XX, 61-64 (where Pliny has ignored the warnings in Dioscorides, IV, 64.6, "as sanat omnia oculorum vitia cum lacte mulierum, argema" [see note 99, above] nubiculas, cicatrices adustionesque omnes, praecipue caligines" [61]; the listing continues, with the *sucus* curing bowels, snakebites, the stings of spiders and scorpions, etc. Pliny quotes Crateuas [63] as recommending this poppy juice for dropsy); XX, 198-203 (authorities quoted: Diagoras, Iollas, Erasistratus, Andreas; this time, Pliny also quotes the warning of Diagoras and Erasistratus [200] in contradiction to XX, 61); XXI, 70 (probable); XXVI, 44 (probable); XXVI, 74 (probable); XXIX, 43 (doubtful); XXX, 60 (probable). The rest of Pliny's references to *papaver* are either to another kind, or are to the use of the poppy as a comparison. Index listings appear in L. Ian and C. Mayhoff, eds., *C. Plinius Secundus: Naturalis Historia*, 6 vols. (Leipzig: Teubner, 1865-1898; reprinted 1970), VI, 289-290, and vol. VII of the Loeb *Pliny: Natural History*, ed. and trans. W. H. S. Jones (Cambridge, Mass.: Harvard University Press, 1956), p. 527.

115. Galen, VI, 548 (= G. Helmreich, ed., *Galeni De Alimentorum Facultatibus*, 31 [*Corpus Medicorum Graecorum*, V, 4, 2 (1923)], p. 258); XII, 72-74; XIII, 37-47 (some collected recipes and authorities). There is enough evidence to suggest that Galen may have encouraged Marcus Aurelius in the use of the drug for its well-known effects; → Thomas W. Africa, "The Opium Addiction of Marcus Aurelius," *J. Hist. Ideas, 22* (1961), 97-102. But maybe mandrake was involved; → E. C. Witke, "Marcus Aurelius and Mandragora," *Class. Phil., 60* (1965), 23-24.

116. Celsus, II, 32 (sleep); V, 23B (part of an antidote), 25.4 (*silvestris papaveris* in the making of *catapotia*, used for sleeping pills, etc.); III, 10.2 (bread soaked *papavere* applied to the head for headache); 18.2 (a drink of *papaver* mixture for sleep); IV, 17.1 (*album papaver* added to the diet for treating kidney disease); 27.1E (from a fragmented text on *coeuntia*, including *nigrum papaver*); 31.6-7 (*papaveris cortices* and *sucus papaveris* in a remedy for joint pains).

Silene venosa in the treatment of epilepsy would refer to the "mild" variety, and the reference in *Historia Plantarum*, IX, 12.5, has parallels in Dioscorides (IV, 66) and Pliny (XIX, 21, and XX, 207).

In *Historia Plantarum*, IX, 13, there appear six plants in rapid order: *nymphaia* (13.1), *hē Skythikē* (13.2), *hē aristolochia* (13.3 = [more or less] IX, 20.4), *to ereuthedanon* (13.6), *skorpios* (13.6), and *polypodion* (13.6). Book IX, 13.4-5, gives a short digression on the color and taste of some plants, suggesting the classification observed in *Causis Plantarum*, VI, 4.5. *Nymphaia* is most probably a yellow water lily (*Nuphar luteum* [L.] Sibth. & Sm.), from which is extracted nuphardine. Theophrastus says that it functions as a wound-clotter (*ischaimon*) and is useful in a drink (wine? water?) for *dysenteria*. *Hē Skythikē* is the "Scythian root" or licorice (*Glycyrrhiza glabra* L.), still useful as a demulcent and expectorant. In Theophrastus, the plant is employed for asthma, dry cough, and as a thirst quencher (he says that with mare's cheese, the Scythians use this root to go without water for twelve or thirteen days); and mixed with honey, the root is good for wounds.[117] *Aristolochia* is a birthwort (probably *Aristolochia rotunda* L.), which Theophrastus recommends for wounds of the head, other wounds, and for what appears to be snakebite.[118] The substance is a sleep inducer, and is useful "for the womb" (*pros hysteran*). There are three methods of preparation and use: as a plaster, steeped in water, and given shredded in honey or olive oil. From the *Aristolochia* spp. comes aristolochic acid, which is employed as an aromatic bitter, and which produces toxic effects in laboratory animals (cardiac and respiratory arrest). *To ereuthedanon* is madder (*Rubia tinctorium* L.), which Theophrastus says is used as a diuretic and for pains in the loins.[119] Extracted from *R. tinctorium* are ruberythric acid and rubiadin. *Skorpios* is a plant sometimes called leopard's bane, one of the composite herbs in the genus *Doronicum*, usually having alternate, clasping leaves and yellow flowers (another plant called leopard's bane is *Arnica montana* L., from northern Europe, which yields tannin, resin, arnicin, arnidiol, and anthoxantine, used as a topical counterirritant). The plant described in Book IX, 13.6, has what appears to be the well-known notion of "signatures," because the root looks like a scorpion. It will, therefore, be effective against scorpion stings. The root would have some small

117. Cf. Scribonius Largus, *Conpositiones* (ed. G. Helmreich [Leipzig: Teubner, 1887]), LXXV. Scarborough, "Asclepiades," pp. 48-49. Dioscorides, III, 5.

118. Cf. Nicander, *Theriaca*, 509-519; Pliny, XXV, 95; Dioscorides, IV, 4.

119. Cf. Pliny, XIX, 47, and Dioscorides, III, 143.

benefit as a counterirritant against scorpion stings,[120] and Theophrastus and his sources have recorded a useful remedy.[121] Ending this section is the curious notice of *polypodion*, which is a fern in the genus *Polypodium* (probably *P. vulgare* L.) with creeping rootstalks, deeply pinnatifid evergreen fronds, and round, bare sori. Again the "doctrine" of signatures appears: not only is *polypodion* useful as a bowel purge, it is a potent charm against *polypoun* ("polyp") because the root looks like an octopus (*polypous*).[122]

After an important description of what drugs will keep – and what that will not[123] – as well as further definition by way of geographical and topographical location,[124] one comes to a short section on the *pharmakōdeis* native to the island of Crete (IX, 16.1-3). Here are *to diktamnon* (16.1), *to pseudodiktamnon* (16.2), and *Heteron diktamnon* (16.3). All three are dittanies, labiate plants. *Diktamnon* is probably the Cretan dittany (*Origanum Dictamnus* L.), said by Theophrastus to be used in difficult childbirth,[125] given in water. *Pseudodiktamnon* and

120. Experimental evidence shows that thiamine deficiency elevates the toxic action of scorpion venom. See Max W. McIntosh and Dean D. Watt, "Molecular Aspects of Neurotoxic Principle in Venom of the Scorpion *Centruroides sculpturatus*," in Findlay E. Russell and Paul R. Saunders, eds., *Animal Toxins* (Oxford: Pergamon Press, 1967), pp. 41-46 (esp. pp. 43, 45-46), and "Biochemical-Immunochemical Aspects of the Venom from the Scorpion *Centruroides sculpturatus*," ibid., pp. 47-58.

121. Cf. Dioscorides, II, 11-12, 33, and 78; IV, 51.

122. Cf. Dioscorides, II, 35 (ζῷα); II, 49; IV, 186.

123. *HP*, IX, 14.1-4. Some examples: ὁ μὲν γὰρ ἐλλέβορος καὶ τριάκοντα ἔτη χρήσιμος, ἡ δὲ ἀριστολοχία πέντε ἢ ἕξ, χαμαιλέων δὲ ὁ μέλας τετταράκοντα, κενταυρὶς δὲ δέκα ἢ δώδεκα (14.1). A pest of these stored roots is σφονδύλη (14.3), some kind of beetle. Section 14.4 is omitted in the MS called U → Einarson, "The Manuscripts of Theophrastus's *Historia Plantarum*," *Class. Phil., 71* (1976), 68-70, and Hort, *Theophrastus*, II, 288, n. 4.

124. *HP*, IX, 15.1-8. E.g., φαρμακώδεις ... δοκοῦσιν εἶναι τόποι μάλιστα τῶν μὲν ἔξω τῆς Ἑλλάδος: Etruria, Latium, and Egypt (15.1); Ethiopia, Scythia, India (15.2 [this last looks like pure legend]); Thrace (15. 3). τῶν δὲ περὶ τὴν Ἑλλάδα τόπων φαρμακωδέστατον: Pelion in Thessaly, Telethrion in Euboea, Arcadia, and Laconia (15.4). Arcadia has cows (and thus the Arcadians drink cows' milk), two kinds of hellebore, carrot (?), a saffron-bay, spurge, marsh mallow, birthwort, hartwort, two kinds of στρύχνος (15.1), the "squirting" cucumber (making ἐλατήριον), and τιθύμαλλος (15.6), and πανάκεια. Most of these plants are in Laconia, too. Achaea has tragacanth (15.8).

125. Soranus (ed. (Ilberg), III, 38.5 (δίκταμνον is part of hot concoctions for the treatment of μύλη [lit. "millstone"] of the uterus); IV, 13(65).2 (rejection of δίκταμνον, among other herbals, recommended by Hippocrates [*Women's Diseases*, I, 77 (ed. Littré. VIII, 170-172)] for rapid childbirth); IV, 14(I 71).2 (Euryphon of Cnidos makes a diuretic to pull out afterbirth [χόριον] from

heteron diktamnon are, as Theophrastus says, much the same as *diktamnon*, except that *pseudodiktamnon* and *heteron* are weaker. *Pseudodiktamnon* appears, however,[126] to be *Dictamnus albus* L., sometimes called fraxinella or gas plant, because it emits a "burning" vapor. *D. albus* is a perennial, rutaceous plant, yielding dictamine (4-methoxyfuro [2, 3-b] quinoline). Even more confused is the account of *heteron*, and Theophrastus's notice does not allow definite identification (Hort offers *Ballota acetabulosa* for *pseudodiktamnon*, and *B. Pseudodictamnus* for *heteron diktamnon*).[127]

To akoniton is Theophrastus's beginning subject in his consideration of harmful plants, and the passages on *akoniton* appear jumbled and occasionally corrupt (IX, 16.5-6). The confusion of the Greek text is illustrated in the development and almost immediate contradiction in the account: *akoniton* can be mixed to give death calculated in advance (two, three, six months, one or two years); it causes a very painful, lingering death, with the body wasting away, and there is no known *lutikon pharmakon* ("counteracting medicinal").[128] The next sentence in 16.5 is contradictory: "Countryfolk occasionally can save someone with honey and wine and similar things."[129] It appears that the two types of traditions – folk and learned – have been set side by side for comparison. Then follow some extremely corrupted passages (16.6) that seem to be about *ephēmeron* (rendered by Hort as "meadow-

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δίκταμνον καὶ ἐλελίσφακος; rejected in IV, 15 [I 72] with πάντα δὲ μοχθηρὰ τὰ προειρημένα. δίκταμνον appears in a gynecological context in the Hippocratic *corpus*, as prescribed by Euryphon, in *Women's Diseases*, I, 78 (ed. Littré, VIII, 176-179), and in *Nature of Women*, 32 (ed. Littré, VII, 346-350).

126. *HP*, IX, 16.2: διαθερμαίνει γὰρ ἀπὸ μικροῦ σφόδρα. τιθέασι δὲ τὰς δεσμίδας ἐν νάρθηκι ἢ καλάμῳ πρὸς τὸ μὴ ἀποπνεῖν. See Ronald Good, *The Geography of the Flowering Plants*, 3rd ed. (London: Longman, 1971), pp. 192 and 344.

127. See Hort, *Theophrastus*, II, 484 and 445.

128. *HP*, IX, 16.5: λυτικὸν δὲ φάρμακον οὐχ εὑρῆσθαι, καθάπερ ἀκούομεν ἑτέρων τι φύεσθαι. Wimmer, ed., p. 157, conjectures ἕτερον τι φυόμενον for the end of the sentence. Hort, *Theophrastus*, II, 300. accepts Schneider's conjecture ἑτέρων, together with an emended reading from the Codex Urbinas (U), and the early printed editions (Editio Aldina, Venice, 1495-1498 [Ald.] and Editio Heinsii [Heinsius], Leiden, 1613 [H]). See the fuller account in Einarson, "Manuscripts of Theophrastus's *Historia Plantarum*," pp. 67-76.

129. *HP*, IX, 16.5: ἀλλὲ τοὺς ἐγχωρίους ἀνασώζειν τινὰς μέλιτι καὶ οἴνῳ. Hort, *Theophrastus*, II, p. 300, attempts reasonable readings from U and the Codex Medici (M: two, but in very close agreement), while a gloss εὕρηνται appears in Ald. and H. Hort's text is the same as Wimmer's p. 157.

saffron") and countermeasures.[130] In 16.7 (after a confused passage about *ephēmeron* being taken by slaves to fake death to outwit masters, then fooling themselves by dying), the text returns to *akoniton*, "which is useless to those who do not understand it." In fact, "one is not supposed to possess it, under the penalty of death."[131] And – seemingly in the carefree manner of a folk tradition – this presumed "legal" statement is followed with the notion that the time that *akoniton* takes to kill is equal to the time since it was gathered.

Even with the confusion in the Greek text of IX, 16.4-7, one perceives a murky theory of toxic action, especially in the choice of *lutikon* to describe what moderns would call an "antidote." As an adjective in the ordinary Greek of Theophrastus's time, *lutikon* is "able to loosen,"

130. U, M, and Ald. all have different versions, largely irreconcilable. Wimmer's readings (pp. 157-158) are as uncertain as those of Hort (II, 300). Hort (ibid., n. 4) states that the passage "is confused, and the text is probably defective." Hort accepts an emendation proposed by Guilandinus (16.6: ἢ τῷ λεφρίῳ; Wimmer: ἢ τῷ αἰρίῳ, from Ald. and H) on the basis of Dioscorides, IV, 84.

131. This may refer to the Athenian officials who administered poison to those condemned to death (e.g., the famous passages in Plato, *Phaedo*, esp. 63d5-e5 and 117b6-9). Κώνειον was the preferred poison, as Theophrastus indicates below (*HP*, IX, 16.9). In Attic law, the *archon basileus* had charge of cases involving poison in homicide (Aristotle, *Athenian Constitution*, 57.2-3), so it may be that he had appointed assistants to aid in carrying out sentences that employed poison. If one extrapolates that no "expert" testimony really mattered in Attic trials (e.g., the "evidence" given by a surgeon, on wounds, in Demosthenes, *Against Conon*, 11-14, is no more weighty than other witnesses; also see Demosthenes, *Against Evergus*, 67, and Lysias, *On the Refusal of a Pension to an Invalid*, 13-14, where *no* medical "evidence" appears; a modern court would demand it), then no "expert" in poisons was involved. Antiphon, *Orations*, I (rendered as "Against a Step-Mother on a Charge of Poisoning" by K. Freeman, *The Murder of Herodes* [New York: Norton, 1963], pp. 86-94), esp. 7, proves that poisons were readily available to citizens in Athens in the late fith and early fourth centuries B.C. General background (procedure, etc.) is given in A. R. W. Harrison, *The Law of Athens*, 2 vols. (Oxford: Clarendon Press, 1968-1971), esp. II, 9 and 134. See a→ Christopher Gill, "The Death of Socrates," *Class. Quart., 67*, n.s. *23* (1973), 25-28. Darrel W. Amundsen and Gary B. Ferngren, "The Physician as an Expert in Athenian Law," *Bull. Hist. Med., 51* (1977), 202-213, deftly analyze the basic question of "expert medical testimony." Amundsen and Ferngren note that two problems cause difficulty in the investigation of this question: (1) the lack of detailed evidence and (2) "the predominant tendency of modern scholars to base their conclusions on comparisons of Athenian private procedure with the much more rigidly defined modern usages" (p. 213). The authors, however, make the important point that Athenian law and its private procedure *could* allow such expert testimony "when [it was] deemed desirable by the individual" (ibid.).

which then is extended into the more specific "laxative."[132] In a medical or pharmacological context, it then can mean "able to loosen [that which tightens]," particularly a harmful substance ingested.[133] The account in Nicander (on hemlock) supports this conclusion,[134] and Gill has shown that Plato left the "choking" out of the *Phaedo* for his own illustrative purposes when discussing philosophic points.[135]

To akoniton is wolf's bane (or monk's hood, friar's cowl, or mousebane), *Aconitum napellus* L., one species in the large genus *Aconitum.*[136] A well-known toxic substance, aconite, was employed as a febrifuge and gastric anesthetic in medical and veterinary practice. No longer used in the pharmacopeia of modern medicine, aconite is sometimes used by veterinarians to treat laminitis in horses. The most powerful of the aconites is *Aconitum Ferox* Wall., the Indian aconite (also called bikhroot, bish, visha, and bishma), used until quite recently by Indians as an arrow poison to kill large animals. Given the confused state of the text in IX, 15.2, it is quite possible that Theophrastus had indeed "heard" stories about Indian arrow poison, as they were filtered through travelers' accounts, along with the tales that came from Somalia and Ethiopia.[137]

132. Athenaeus, III, 92c (quoting Mnesithius = frag. 36, in Janine Bertier, *Mnésithée et Dieuchès* [Leiden: Brill, 1972], p. 194), and Pseudo-Aristotle, *Problems*, 949a5.

133. Later theories of toxic action (those of Galen, etc.) did not employ the laxative notion, but modified it to mean a "drawing out" of the poisons, as well as a way of correcting the imbalance in the innate heat caused by the poison. Galen, IV, 584; X, 896; XI, 761 and 823. Scarborough, "Nicander's Toxicology," p. 10 and n. 114. Walter Pagel, "Peripheral Venous Flow 'Ascending' to the Heart (Ficinus 1489) and the Spread of Poison," *Episteme, 6* (1972), 128-134 (esp. 129).

134. Nicander, *Alexipharmaca*, 186-194.

135. Gill, "Death of Socrates," pp. 25-28 (esp. pp. 25 and 28).

136. Good, *Flowering Plants*, p. 85: there are over 200 species in *Aconitum*.

137. *HP*, IX, 15.2, indicates the muddled and questionable nature of Theophrastus's sources with εἴπερ ἀληθῆ λέγουσιν. The only arrow poison identified by Hort (*Theophrastus*, II, 290-291, and 485) is the ῥίζα θανατήφορος, "Somali arrow-poison, *Acokanthera Schimperi*." Called Abyssinin or carissin, the glycoside in the root, bark, and seeds of *A. schimperi* (A. DC.) Beth & Hook. is the active principle of carissin, or African arrow poison. The state of the text in *HP*, IX, 15.2, suggests conflation, since Ethiopia and Scythia have the poison, followed by ἐν Ἰνδοῖς, where the text becomes extremely corrupt. E.g., ἥ τε δυναμένη τὸ αἷμα διαχεῖν καὶ οἷον ὑποφεύγειν makes little sense, unless one assumes a "flight" of arrows, rather than blood. These passages in *HP*, IX, are illustrative of the need for a critical edition. ἃ δή φασιν εὑρῆσθαι πρὸς τὲ τῶν ὀφιδίων τῶν θανατηφόρων suggests a filtered story about Indian cobras and the like, compacted with other tales of arrow poisons, antidotes, and drugs. Even after Alexander's expedition, "India" simply meant Ethiopia and the

Thus, in addition to Diocles of Carystos,[138] and the *rhizotomoi-pharmacopōlae*,[139] Theophrastus employed some garbled tales that had trickled in from the "East" to Greece over several centuries. There are, of course, some instances in the *Historia Plantarum* that indicate clear contact and awareness of Alexander's discoveries in Media and India,[140] but even in these passages there is an uncertainty that mitigates against any systematic collecting of data on plant lore from the expedition of Alexander into India.[141]

More important to Theophrastus than odd stories from India, Ethiopia, and points east are the local authorities he cites for some of his account on hemlock. In IX, 16.8, we are told that Thrasyas of Mantinea discovered – so it was said – the painless death from the juices of hemlock (*kōneion*) and poppy (*mēkōnos*) and other such plants. No more information follows on the poppy, so that confusion appears between the two (earlier in IX, 12.3-5, no opium poppy appears), as the Greek *kōneiou . . . mēkōnos* (perhaps rendered "hemlock poppy" or "poppy hemlock") would suggest (IX, 16.8). Thrasyas made small doses of the poison (a drachma or so), which worked very well, and kept indefinitely. Thrasyas's student Alexias was also skilled in these matters. Neither Thrasyas nor Alexias is known from other sources, unless the "Thrasea the surgeon" of Scribonius Largus (208 Helmreich) and Galen (XIII, 741) is the same as Theophrastus's Thrasyas (Galen gives a recipe of Thrasea [*Tharseos* in the Kühn text] called the Indian"). It is probable that Thrasyas and Alexias were either informants (like the Satyrus in *Historia Plantarum*, III, 12.4) or deceased predecessors, given

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Somali coast (Strabo, I, 61, and XV, 86-87) and the *Indica* of Ctesias "showed [that the Greeks] could not tell true stories of distant lands from false ones" (M. Cary and E. H. Warmington, *The Ancient Explorers* [Harmondsworth: Penguin Books, 1963], p. 80). See also Truesdell S. Brown, *The Greek Historians* (Lexington, Mass.: D.C. Heath, 1973), pp. 77-86 (esp. pp. 81-83); Ctesias knew of Scylax, probably through Herodotus. In addition to Brown's notes for the sources on Ctesias, see H. H. Wilson, *Notes on the Indica of Ctesias* (Oxford: Ashmolean Society, 1836), a pioneering work employing Sanskrit and Persian comparisons.

138. See notes 9, 10, and 17, above.

139. See note 17, above.

140. Theophrastus's notices on "India" show a fuzziness, even in the context of Alexander's expedition; see e.g., *HP*, IV, 1 (εἶναι μυθολογοῦσι and λέγεται [Wimmer] on Indian ivy and Alexander). Hort, *Theophrastus*, I, 310-311, thinks the text is defective. See Wimmer, ed., under Ἰνδοί.

141. The exception may be the description of some flora by the admiral Androsthenes on a voyage from the Indus to the Persian Gulf: *HP*, IV, 7.7, and V, 4.7-8; see *De Causis Plantarum*, II, 5.5 (on the island of Tylos [Bahrein]: teak wood, calamader wood, and peculiar qualities of rain on the island).

Theophrastus's habit of not naming contemporary authorities.[142] The clipped description in *Historia Plantarum*, IX, 16.8-9, on the dosage fairly well agrees with the methods described in Plato's *Phaedo*, 63d5-e5 and 117b6-9, and Thrasyas and Alexias probably lived at least a generation before Theophrastus. Likewise, the description of the better "preparation of *kōneion*" (IX, 16.9) seems enough like the picture (however mauled) in the *Phaedo* to indicate that Theophrastus's information emerged around 400 B.C. He says that previously (*proteron*) the Cheans (Ceos) used *kōneion* like everyone else, simply shredding it up. Somebody from Ceos was the source of this small bit of recent history. Now – Theophrastus continues – the method is much better: one strips off the outer shell, removing the husk because this part is not easily assimilated;[143] then one bruises it in a mortar, runs it through a fine sieve, and finally sprinkles it on water to drink.[144]

Kōneion is the famous hemlock quaffed by Socrates in 399 B.C.[145] The plant is *Conium maculatum* L., and bears various popular names, including poison parsley and spotted cowbane, as well as the usual hemlock. *C. maculatum* yields coniine (conicine; cicutine; 2-propylpiperidine) that causes the classic symptoms: weakness, sleepiness, nausea, vomiting, difficult respiration, paralysis, asphyxia, and death. Two modern derivatives are part of the pharmacopeia: coniine hydrobromide and coniine hydrochloride. Both are occasionally employed as antispasmodics, and both derivatives are highly toxic.

Theophrastus develops further his ideas on toxic action, first mentioned in *Historia Plantarum*, IX, 16.4-7. In IX, 17.1, he returns to hellebore to illustrate how one could build resistance to toxic drugs, as did Thrasyas by eating hellebore. In IX, 17.2, Theophrastus proposes that *asynetheia* ("unfamiliarity") may be the reason that some *pharmaka* give toxic, rather than beneficial, effects. Thrasyas had proved that once the *physis* of man's body had accepted (*prosdexamenēs*) *pharmaka*, the

142. See Benedict Einarson and George K. K. Link, eds., *Theophrastus: De Causis Plantarum* (Cambridge, Mass.: Harvard University Press, 1976), I (bks. I and II), xix-xx: "Other writers on agriculture are occasionally mentioned, but only when (like the philosophers) they were no longer living . . . It was good form not to mention a contemporary by name."

143. *HP*, IX, 16.9. Cf. *De Causis Plantarum*, I, 14.4.

144. Cf. Plato, *Phaedo*, 117a. Hans Gossen, "Schierling," *RE*, suppl. vol. VIII (Stuttgart, 1956), cols. 706-710.

145. Although Plato uses only φάρμακον in the *Phaedo*, the traditional view that Plato's φάρμακον = κώνειον is well argued by John Burnet, ed., *Phaedo* (Oxford: Clarendon Press, 1911), Appendix I, and accepted by R. Hackforth, trans., *Plato's Phaedo* (Cambridge: Cambridge University Press, 1955), p. 194.

physis overcame (*katakratousēs*) them, and they were no longer *pharmaka*. Like Plato before him in the *Phaedo*, Theophrastus generally uses *pharmakon* to mean "drug," while rarely one reads *thanatēphoros* when he means "deadly drug" or "poison" (for example, *Historia Plantarum*, IX, 16.7).[146] Later medical and toxicological authorities employ a more specific vocabulary,[147] but this notion of "overcoming" the poison became quite popular among rulers who feared assassination by poisoning.[148] Mithridates VI of Pontus became quite famous for his antidote concoctions, which he presumed gave him immunity from the insidious assassin armed with poisons.[149]

With the exception of IX, 18.3-11, the remainder of the passages about herbs and herbals in *Historia Plantarum* discusses a curious mixture of plants, ingredients, and folk traditions. Book IX, 18.3-11, is an extended section on substances that "have effect on both the body and the powers of the mind" (18.3).[150] These passages deserve detailed analysis, because they include a number of *pharmaka* that have *dynameis* for both men's and women's sexual problems. Consequently IX, 18.3-11, is a rich source of aphrodisiac lore, beginning with the observation that most of the ingredients that follow act "like squill" (18.3-4).[151] The major authority cited by Theophrastus in these passages is Aristophilus of Plataea (18.4), who seems to have been a drug-vendor a specializing in love potions. Many of the traditions have complex histories, and many of the plants named are puzzling.

Odds and ends remain. *Akantha* appears in IX, 18.1. This is used for fractures, coughs (mixed in sweet wine), and various wounds (mixed in olive oil).[152] *Akantha* is gum arabic, or acacia, the dried gummy exuda-

146. Other references in *HP* for θανατήφορος are: IX, 13.4; 15.2; 16.4. In *De Causis Plantarum*, θαναθήφορος occurs in VI, 4.5 and 5.5.

147. E.g., Nicander, Galen, and Philumenus.

148. E.g., Attalus III of Pergamon. See Galen, XII, 252, and XIII, 416.

149. Galen, XIV, 2 (Mithridates and Attalus), XIII, 23, 52-54, 329-331, XIV, 2-3, 152-154, 283-284; Pliny, XXV, 6-7; Aulus Gellius, *Attic Nights*, XVII, 17. See Gilbert Watson, *Theriac and Mithridatium* (London: Wellcome Historical Medical Library, 1966), pp. 33-44.

150. Without warning, Hort in *Theophrastus* omits both text and translation of *HP*, IX, 18.3-11. The text with a Latin translation is in Wimmer, ed., pp. 159-161.

151. Squill is *Urginea maritima* (L.) Baker. A basic reference is Jerry Stannard, "Squill in Ancient and Medieval Materia Medica, with Special Reference to Its Employment in Dropsy," *Bull. N.Y. Acad. Med., 50* (1974), 684-713 (esp. 686-696).

152. Cf. Dioscorides, III, 146, and Pliny, XX, 84.

tion from the stems and branches of *Acacia senegal* (L.) Willd. and other species of African acacia.[153] The gum contains tannin. Medically, acacia is used as a demulcent, and once was employed as a colloidal solution (intravenous) for shock and edema. Veterinarians use acacia as a demulcent for mild diarrhea in small animals, foals, and calves. *To thleyphonon* (18.2) is another name for *skorpion* (wolf's bane, in the genus *Aconitum*), useful against scorpion's sting (see IX, 16.5-6, above). *Strychnos ho manikos* (IX, 19.1) is the same as the thorn apple, which caused madness in IX, 11.6, above. Also in IX, 19.1 is the root of the *onothēras* (= *daphnē hē agria*),[154] which when mixed with wine elevates the mood. *Onothēras* is oleander (*Nerium oleander* L.), from which one gains oleandrin (folinerin), used in modern medical practice for cardiac insufficiency; oleandrin is a powerful diuretic. In IX, 19.2, Theophrastus scorns the use of charms and amulets (*alexipharmaka*), which seem to have been quite popular in his time. The term *alexipharmakon* soon took on the specific meaning in Greek of "antidote," best illustrated in Nicander's poem bearing the name.

Heleiochrysos (19.3), *peperi* (20.1), the Cnidian *kokkos, peukedanon, daukon* (20.2), *ampelos hē agria* (= *mēlōthron*), *drakontion, thapsia* (20.3), *to tēs ebenou xylon, aristolochia* (20.4), *skammōnia*, and *pteris* (20.5) are the plants and substances listed in the last section of *Historia Plantarum*. One medicinal appears in *On Odors* by Theophrastus: *to megaleion* (35). *Heleiochrysos* is useful for burns (mixed with honey) and for *ta daketa* ("stings" or "bites" of venomous animals).[155] This is probably the gold flower (*Helichrysum siculum* L.), also recorded in Nicander, *Theriaca*, 625, as a remedy for poisonous bites. It has had little use in the pharmacopeia since the eighteenth century. *Peperi* is used, says Theophrastus, as an "aid" against hemlock, like frankincense (*ho libanōtos*: in the *Boswellia* spp., yielding olibanum as a gum resin).[156] *Peperi* is pepper (*Piper nigrum* L.), which gives piperine (1-piperoylpiperidine), toxic to houseflies, but harmless to humans. Ingestion of large amounts of black pepper might cause vomiting. *Knidios kokkos* (= *kneōron*) appears also in *Historia Plantarum*, VI, 1.4, as a spinless low-growing shrub. In IX, 20.2, the "Cnidian berry" has many

153. Kordofan gum (from the Sudan; *Acacia verek* Guill. & Perr.) is considered better than the old "gum arabic," or gum Senegal. See C. L. Mantell, *The Water-Soluble Gums* (New York, 1947).

154. Cf. Dioscorides, IV, 117, and Pliny, XXVI, 111.

155. Galen, XIV, 231, is much clearer: *τῶν δακετῶν θηρίων*. Cf. Dioscorides, IV, 57; Pliny, XXI, 168 and 169; and Vettius Valens (ed. Kroll), 127.29.

156. Cf. Dioscorides, II, 159, and Athenaeus, II, 73.

uses: its heating quality (*thermotēti*), along with its power to open up the bowels, and its use in pills to prevent throat burns make the *kokkos* quite beneficial.[157] *Kokkos* is from *Daphne gnidium* L., sometimes called the olive spurge, dwarf bay, mazereon, magell, and a number of other names, which yields (from the seed) a fixed oil and acrid resin, and (from the bark) mezerein and daphnin. A combined extract called mezereum was formerly used in medicine as a vesicant and epispastic. *Peukedanon* is also "heating" (*thermatikon*), and is used to make a sweating ointment, and the root is for the spleen.[158] *Peukadanon* is the sulfur wort (*Peucedanum officinale* L.), which gives (from the root) peucedanin (4-methoxy-5-isopropylfuro [1,3:6,7] coumarin), used in experimental animals in the investigation of antineoplastic agents. *Daukon* is some kind of wild carrot,[159] recommended as *thermatikon.*

Ampelos hē agria is also *thermatikon* and *drimu* ("pungent"), and is used as a hair remover, freckle remover, skin and leather smoother.[160] The plant is bryony (*Bryonia alba* L. or *B. dioica* Jacq.), which contains many "pungent" and toxic substances, including bryoamarid glycoside, bryonin, bryonidin, bryonicine, an oil, and resin. Once employed by physicians and veterinarians as a purgative, bryony has been replaced by more uniform drugs. *Drakontion* is a root that stops coughs when mixed with honey, and is probably the edderwort (*Dracunuculus vulgaris* L.).[161] *Thapsia* is again (as in IX, 8.3) *Thapsia garganica* L. ("the deadly carrot"), which purges "up and down" and which removes bruises.[162] Again Theophrastus lists *aristolochia*, as he did in IX, 13.3, with basically the same suggestions for its use. *Skammōnia* is the scammony (*Convolvulus scammonia* L.), as in IX, 9.1; here, in IX, 20.5, Theophrastus says that only the juice is useful, while in IX, 9.1, both the root and juice are included. No benefit comes in either listing, nor is there any more medicinal information in IV, 5.1. It appears that something has been omitted in the MSS,[163] as comparison with other Greek

157. Cf. Pliny, XXVII, 70; Dioscorides, I, 36; and Pliny, XV, 25; XXIII, 89.

158. Cf. Pliny, XXV, 117.

159. Probably *Malabaila aurea* L. here in IX, 20.2 (and IX, 15.8), as contrasted with δαῦκον in *HP*, IX, 15.5. Galen, VI, 654, and XI, 862, seems to be writing about another species. Cf. Dioscorides, III, 72, Nicander, *Theriaca*, 94, 858, 939; *Alexipharmaca*, 199; and *Scholia on Theriaca*, 94.

160. Cf. Dioscorides, IV, 181-183; Pliny, XXIII, 19 and 21; Galen, XI, 826.

161. Cf. Dioscorides, II, 167; Pliny, XXIV, 89.

162. Cf. Dioscorides, IV, 153; Pliny, XIII, 125 and 126.

163. Einarson, "Manuscripts of Theophrastus's *Historia Plantarum*," p. 70: "even in U* the concluding passage (9.19.4 through γίνεσθαι in Wimmer's text) is evidently incomplete."

and Roman medical sources would indicate.[164] Greek and Roman physicians valued scammony as a purgative, and it continued to be used until quite recently, because of its constituents, which include starch, ipuranol, a reducing sugar, a methylesculetin, dihydroxycinnamic acid, and resin (8-13 percent). *Pteris* is the male fern (*Dryopteris filix-mas* [L.] Schott.), which "expels the flat worm."[165] Modern medicine still values this very reliable antihelmintic, used as the oleoresin of aspidium (an ether extract of the male fern), which has at least 24 percent crude filicin. In humans, the drug is a stable antihelmintic, with various side effects (headache, yellow vision, colic, dizziness, and so on), that are easily controlled. Veterinary medicine uses the oleoresin of aspidium in the treatment of taeniasis, and against liver flukes in ruminants. This is one of the few pharmaceuticals from antiquity that has retained its value, in an era of ever more sophisticated laboratory synthesis.[166]

In *On Odors*, 35, *megaleion* is recommended as being a great help for all sorts of wounds. In *Historia Plantarum*, IV, 2.1 and 2.6, one finds a *balanos*, from which is made (*Odors*, 29) *megaleion* out of burnt resin,[167] and oil. Pliny (XIII, 13) says that the medicinal was named after Megallos, who invented it. *On Odors*, 35, notes that it is most effective when mixed with cassia cinnamon and myrrh. *Balanos* is probably *Balanites aegyptica* L., an Egyptian plant that bears a fruit like an acorn (hence the name).[168] The benefit for wounds came from the myrrh, *Commiphora myrrha* (Nees) Engl.[169] The last "herbal" would not fit Theophrastus's original definition, given in the beginning sections of this essay, but it would fit his notions of beneficial or harmful plants and their derivatives. In *Historia Plantarum*, IX, 20.4, one reads of the interesting *to tēs ebenou xylon*, ebony wood from *Diospyros ebenum* Koenig, the Macassar ebony, most common in India and Sri Lanka. This reference might be derived from some reports from India that appear in IX, 20.4, and the context of IV, 4.6, confirms this suspicion. In IV, 4.5, Alexander has ordered his men not to eat mango,

164. E.g., Pseudo-Aristotle, *Problems*, 864a4 and b13; Dioscorides, IV, 170, and V 73; Nicander, *Alexipharmaca*, 565; Pliny, XIV, 110 (as in Dioscorides, V, 73).

165. See also note 100, above. Cf. Pliny, XXVII, 145.

166. Hill, *Economic Botany*, p. 264, with a short summary. Harry F. Dowling, *Medicines for Man* (New York: Knopf, 1973), pp. 14-17, is very negative about the use and usefulness of ancient drugs: "Less than two dozen effective drugs were known before 1700" (p. 14). Aspidium appears on his short list.

167. Cf. Pliny, XIII, 7; Dioscorides, I, 58.3, and IV, 157.

168. *HP*, III, 8.3 (acorn), and IV, 2.6 (tree which has βάλανοι).

169. Cf. Celsus, V. 27 (myrrh for burns); Majno, *Healing Hand*, pp. 216-219.

and IV, 4.6, mentions the two kinds of ebony that occur in India. The second species is most likely *D. melanoxylon* L., which also occurs in northeastern Africa. It is probable that Theophrastus had some direct account of Alexander's expedition in India, but it seems that he combined this report of ebony wood with other, more local information.[170] In IX, 20.4, one reads that the wood, when rubbed on a whetstone, is useful for the eyes.[171] A section on ebony in Dioscorides (I, 98.1-2) solves the puzzle, because he picks up the same treatment, vaguely noted in Theophrastus; Dioscorides specifies the ebony and the manner of preparation of the eye salve. He says that the wood becomes yellow when rubbed on a whetstone, and that of the two kinds (Ethiopian and Indian), the Ethiopian is the better, because the Indian variety is streaked and spotted; furthermore, some try to sell other kinds of wood (like the acanthus) as if they were ebony (*Materia Medica*, I, 98.1). The eye salve (*kollyrion*) is prepared as follows (I, 98.2): the scrapings or dust of the ebony wood is steeped in Chian wine for a day and a night, then beaten into the consistency of eye salves (*kollyria*). Another method is to beat the scrapings and dust first, then sift then, and then soak them in the wine; some will use water instead of wine. A third method is to burn the dust and scrapings in a bowl, and then to wash the coals as one did white lead (*molybdos*).[172] Theophrastus has recorded a fragment of an apparently well-known remedy, and the state of the text may explain the strange omission of many details.[173]

There are forty-three major herbs and herbals (omitting IX, 18.3-11) in *Historia Plantarum* IX and *On Odors*. Five are toxic: mandrake (IX, 9.1), hellebore (IX, 9.2 and 10.1-4), the *strychnoi* (IX, 11.5-6), wolf's bane (IX, 16.4-7), and hemlock (IX, 16.9). There is one wood (Ethiopian or Indian ebony: IX, 20.4), and the male fern (IX, 20.5). Additionally, there is one animal product: the curd of the monk seal (IX, 11.3). There are no minerals, but *On Stones*, 23-24, notes that *smaragdos* is "good for the eyes."[174] The vehicles are wine, vinegar, honey, and water. If

170. "Local" in this case means Egypt, where the name originated. Herodotus, III, 97; Theocritus, XV, 123. Other references in *HP* suggest a kind of combination: I, 5.4 and 5; V, 3.1 and 2.

171. Cf. Pliny, XXIV, 89.

172. Cf. Galen, XI, 867-868.

173. Ebony dust (appearing in Dioscorides, I, 98) is omitted in Harald Nielsen, *Ancient Ophthalmological Agents*, trans. from the Danish by L. McBride (Odense: Odense University Press, 1974).

174. *On Stones* (ed. Eichholz, p. 64): ἡ δὲ σμάραγδος . . . καὶ πρὸς τὰ ὄμματα ἀγαθή. σμάραγδος may be green basalt, or green Aswan granite

Wellmann is correct,[175] Theophrastus derived many of his remedies from the works of Diocles, but it is clear that Theophrastus was a shrewd, independent collector of data in his own right,[176] including information on medicinals. The list of herbals assembled in *Historia Plantarum* IX became the direct ancestor of all later drug treatises in antiquity, and many traces of Theophrastus's (and Diocles's) original observations survive in the *Materia Medica* of Dioscorides. The analysis of the various plants and plant derivatives shows that the Greek *rhizotomoi* and drug-vendors had collected much valuable information on the medical employment of plants, and Theophrastus invented a format for this type of information that would be followed after his own time. Dioscorides adds many other names for the plants, so that the modern scholar can, in the majority of cases, key the genera and species, and thereby determine medical utility. Theophrastus's herbs and herbals show that, in the fourth century B.C., *pharmaka* were well known, and those that were especially beneficial and harmful had been carefully studied. It is to Theophrastus's credit that he used information supplied by the root-cutters and drug-vendors, who could either verify or refute many notions that might have become "common knowledge."[177]

(Eichholz, p. 103). Sometimes, according to Galen (XI, 867-868), ebony was confused with "stones."

175. See notes 13-17, above.

176. Sources and references are collected in Einarson and Link, eds., *Theophrastus: De Causis Plantarum*, xix-xxiii.

177. Lynn Thorndike, "Disputed Dates, Civilization and Climate, and Traces of Magic in the Scientific Treatises ascribed to Theophrastus," in Charles Singer and Henry E. Sigerist, eds., *Essays on the History of Medicine Presented to Karl Sudhoff on the Occasion of his Seventieth Birthday* (London: Oxford University Press, 1924), says Theophrastus "assures us that many remedies and antidotes have been brought to human notice by the example of animals who employ them" (p. 79).

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The Drug Lore of ASCLEPIADES *of Bithynia**

by John Scarborough**

ONE OF the most influential figures in Roman medical history is Asclepiades of Prusa, the major city of Bithynia in northwestern Asia Minor. Numerous sources, both medical and non-medical either mention him in passing, or take the trouble to recount his medical thinking and recall his remarkable career in the last century of the Roman Republic. It is, therefore, quite surprising that his writings have survived only in fragmentary form, in quotations given by other authors who often cite Asclepiades to refute him.

The modern scholar owes most of the extant material from Asclepiades to Galen and Caelius Aurelianus, both of whom rail against the false teachings of the renowned physician. Galen, with his constant beacon of teleological medicine before him, denies Asclepiades' mechanistic medicine. Galen's influence on subsequent medical philosophy was well in tune with his own century which witnessed Stoicism as the major philosophy, practiced by the emperor, Marcus Aurelius (A.D. 162–180). It effectively smothered any remaining impact of Epicurean-like medical philosophy.[1]

Caelius Aurelianus was a gifted translator of Greek medical works into Latin, and he provided summaries of Soranus and other Greek materials that had come down to his own time, the fifth century. Included in his synopsis are a good number of citations from Asclepiades' lost works, including those on drugs. Other fragments of Asclepiades' writings emerge from Celsus, Scribonius Largus, Pliny the Elder, Rufus of Ephesus, the *Anonymus Londinensis*, and the Byzantine court-physician, Theophilus Protospatharius.

Biographical details about Asclepiades are scant. Cicero notes that he was a friend of Lucius Licinius Crassus,[2] which places him in Rome about 90 B.C.[3] Pliny writes that Asclepiades had come to Rome, expecting to make a living in the teaching of rhetoric, but found medicine more lucrative, and thus switched professions with a minimum of effort.[4] Although most historians of medicine would agree with Wellmann's dismissal of Pliny's assumption that Asclepiades the doctor had once been a teacher of grammar and rhetoric,[5] a strong case can be made

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that Asclepiades of Prusa was indeed the well-known rhetor of Myrlea, by the same name. Myrlea was another city in Bithynia, about twenty miles from Prusa, the time of activity is roughly the same, and Sextus Empiricus quotes from an Asclepiades who appears to be both physician and grammarian.[6]

Asclepiades' medical teachings appealed to the Romans, since he avoided the great surfeit of terms and sophisticated philosophical reasoning characteristic of the Greek medicine coming to Rome.[7] There are many short accounts of his simplified medicine, general treatment, and effective relationships with his patients.[8] He became famous for his aphorisms, "the duty of the physician is to treat safely, quickly, and pleasantly;"[9] "treatment consists merely of three elements: drink, food, and the enema;"[10] and "the use of wine is hardly less equal than the power of the gods."[11] Fame also resulted from Asclepiades' deed of "raising a man from the dead,"[12] although the sources make it clear that the man had been prematurely prepared for his own funeral.

Gossip in the time of the Emperor Claudius (A.D. 41–54) told of some kind of scandal in the family of Asclepiades, supposedly involving murder or treason by his son-in-law.[13] The "treason," however, may be leftover rumors from the time of Pompey—who lost the gamble for power to Caesar at Pharsalia in 48 B.C. Asclepiades was part of the circle around Pompey, as proven by a dedication of one of his works quoted in Caelius Aurelianus,[14] to Geminius, a powerful associate of Pompey.[15] Finally, Pliny records that Asclepiades died in old age by a fall.[16] His career in Rome was long and illustrious, from about 95 to 45 B.C., given Pliny's statement about Asclepiades' elderly demise. His youth and old age remain obscured, unless one presumes Asclepiades of Myrlea was the same man, as Pliny did. If true, then his youth was spent in the court circles of the Bithynian king, and he died in Spain, while writing on the customs there.[17]

Asclepiades' medical philosophy was based loosely upon current Epicurean notions, the most basic being that all life (and death) was an accidental process, and that there was little validity in the assertion that life or its forms had any particular purpose (the teleological or Vitalistic view).[18] Wellmann is correct in noting that Asclepiades' medicine was "unoriginal,"[19] since his approaches to medical treatment had been anticipated by Heracleides and Cleophantus. Important for Asclepiades was Heracleides' concept of the small particles, the indivisible pieces of matter that made up all parts of the human body,[20] an idea derived ultimately from the "atoms" of Leucippus and Democritus,[21] and refined in some respects by Epicurus.[22]

IN THE last century of the Roman Republic, Epicurean/mechanistic ideas were in great vogue,[23] especially illustrated by the eloquent verses of Lucretius' *De rerum natura*. Groups of intellectuals gathered to study the philosophical ramifications of mechanistic concepts, and Cicero grudgingly acknowledges the popularity of the philosophy among the leading intellectuals of his time.[24] Excavations at Herculaneum have uncovered a library of one of these schools,[25] and there were probably many more. It was thus no accident that Asclepiades chose this outlook for his medical philosophy, and it is little wonder that his practice was so successful. It is, however, far from the truth to call him a fraud, as the

pharmacy below will demonstrate. He can be called an opportunist, and he did reject anatomy in favor of symptoms, but his medical view was firmly grounded in a carefully reasoned application of drugs and what today might be termed Common Sense. Given some of the awful prescriptions then offered as beneficial, one may sense the appreciative reception he gained from intelligent Romans who were told they had a good deal of knowledge about medicine, too.[26] One may also divine why the "professional" physicians of later antiquity excoriated him, especially in light of Galen's statement that he was pleased when patients regarded him as a worker of wonders and even magic.[27]

Most modern authorities, in their summary accounts of Asclepiades, write that he eliminated drugs from medicine. This may reflect a hurried reading of Celsus, V, prooemium, 2, which tells of the great use of drugs among the "ancient authorities" (*antiqui auctores*), including Erasistratus, Herophilus, Zeno, Andreas, and Apollonius Mys. Celsus continues by saying that Asclepiades dispensed "with drugs for the most part" (*ex magne parte*). In another passage, Celsus further qualifies what Asclepiades did with drugs. The Bithynian had done away with drugs that the ancients had used to "assimilate food during fevers, since they feared indigestion most of all."[28] Also, Asclepiades is given credit for being the "first to concern himself with anything more than what custom and tradition handed down to him" in medicine.[29] W. G. Spencer, in the introduction to Volume II of his generally excellent text and translation of Celsus' *De medicina* (Loeb), writes in this context: "Purgatives are comparatively few and treatment by clystering the bowel was preferred by Asclepiades, whom Celsus is inclined to follow."[30] Spencer thus defines one of the pharmaceutical principles followed by Asclepiades: there were very few internal drugs that he prescribed, although there are traces of a book he wrote, entitled *On Internal Remedies*.[31]

Misleading also is a rapid reading of the introductory section ("To Gaius Julius Callistus") of Scribonius Largus' *Compositiones*. First, one reads, "but Asclepiades, the greatest medical authority, refused to give drugs to the sick."[32] Shortly, however, Largus adds—having said that Asclepiades "will have seen what he will have perceived," a thought difficult to grasp,[33]—"he denied giving drugs, because he judged rightly that occasionally giving food and wine cures patients completely. But for all that, in his book, entitled *Paraskeuon* (that is, "Preparations"), he asserts that it is the greatest alloted duty of the doctor not to follow some single thing with its flaws, or for that matter, two or three particular prescriptions which are proved and continuously experienced."[34] It seems that Asclepiades wanted a great variety in his drugs, as Largus goes on to say.[35] Celsus and Largus both quote prescriptions from Asclepiades' treatises, which were written in Greek. Largus' Latin reflects a good deal of street-level speech,[36] and his native tongue was Greek, while Celsus knew Greek in the manner of the Roman upper class in the age of Tiberius.[37] Other works of Largus are known through citations in Galen,[38] and it seems that the extant *Compositiones* ("Prescriptions") was written at the request of Callistus, a freedman of the Emperor Claudius. Consequently, several points become clear from the citations of Largus and Asclepiades in Celsus, Galen, Caelius Aurelianus, and other extant sources: (1) Largus normally wrote in Greek

(2) Asclepiades' works were in Greek, although Largus may hint that the *Paraskeuon* was a bilingual text[39] (3) the drug lore of Asclepiades would be that of the Greek and Hellenistic medical traditions, as contrasted to the native Roman folklore-prescriptions often seen in Cato and Pliny, and (4) Asclepiades' prescriptions and notions about drugs were regarded with some esteem by later medical writers. The greatest number of drug-lists from the writings of Asclepiades comes from Galen, even while he fulminates against the dolts and poltroons who follow the mechanistic system of medicine (generally, the Methodistic Sect, which claimed Asclepiades as a direct ancestor).[40] It appears that Asclepiades left his greatest mark in later medical literature through his prescriptions and commentaries, not his medical philosophy.[41]

Asclepiades' drug theory was closely related to his general theory of disease. He believed, first of all, that in digestion, "absorption takes place from crude foods only."[42] The particles of food were extremely small, and indigestion came when the particles were too big. Thus illnesses generally occurred, when the "little bodies (*corpuscula*) were brought to a stop" in their passage through "the invisible pores" that filled the body.[43] It would be the task of the doctor to unclog the pores and passages. Wine and food in proper amounts were best in treatment,[44] followed by giving an enema, which would extract the improper food doing the damage.[45] As a logical consequence, Asclepiades believed that using drugs for purging was fruitless, since "all the substances were produced by the drugs themselves."[46] In giving this statement of Asclepiades' drug theory, Galen displays one of his professional snits while he writes at great length to refute Asclepiades and generally the Epicurean notions of medicine and pharmaceutical treatment. Galen is particularly aghast at Asclepiades' idea that it did not really matter if a doctor "gave a drug for the removal of water, or a drug which removed bile, since they all purge equally and dissolve the body, and produce a solution that has such and such an appearance, which did not exist in that state previously."[47] This seems incredible——and simply stupid—to Galen, who believed in the Hippocratic view of humors, and how drugs acted on those humors: "Some drugs purge away the yellow bile, others purge away the black bile, some others will rid the body of phlegm, while yet others will eliminate the excess water."[48] To Asclepiades, the whole concept of the humors was irrelevant in medicine, and drugs remained their own substance in all pharmaceutical therapy. Even though Mithridates of Pontus (d. 63 B.C.), the famous inventor of an all-inclusive antidote named after him, valued Asclepiades' drug-recipes,[49] Galen cannot refrain from hurling his bombast at Asclepiades for twenty and more pages of the Kühn edition of *On the Natural Faculties*.[50]

Most of Asclepiades' internal remedies are unknown, although traces of his *Peri ton entos pathon* (roughly, "On Internal Ailments") appear in Galen.[51] Wine, or wine with salt, probably was the major potion.[52] Many of the extracts in Galen, moreover, stemming from Asclepiades' drug treatises, were compiled previous to Galen's own time. Asclepiades' recipes are often jumbled together with those of Heras, Asonus (otherwise unknown: gives extracts from five books by Asclepiades on internal remedies for poisons. Galen, XIV, 135-146), Marcellus, Antonius Musa, and Dioscorides, among others.[53] The combination with Dioscorides is expected, since in the beginning of his

Materia Medica, Dioscorides notes that some of his major sources are "Asclepiadean."[54]

PLINY records a bit or two of Asclepiades' lost antidote writings, although isolation of Asclepiades from Dieuches and other earlier (and later) drug collectors is difficult. In his discussion of oxymel, Pliny says he is giving the prescription from Dieuches,[55] and the same formula is found in Dioscorides.[56] The prescription is the standard one for oxymel: ten minae of honey, five heminae of "old vinegar, a pound and one fourth by weight of salt from the sea, added to five sextarii of water." Then one was to boil the whole concoction in a large cauldron, taking it "off from boiling ten times," and then put it away for storage.[57] Pliny goes on to say that Asclepiades condemned oxymel,[58] much as Caelius Aurelianus says Asclepiades rejects oxymel in treatment of delirium.[59] In the next few lines, however, Pliny writes that Asclepiades "admits that oxymel was beneficial against the snake [or lizard] known as Seps as well as against poisoning by opium and mistletoe."[60]

The confusion in Pliny's account is explained by the manner in which Asclepiades' antidote books (as well as those by Mithridates of Pontus) became known after Pompey's day: "When Pompey conquered Mithridates, and gained all the spoils of war, he had his freedman Lenaeus translate all of the books [including those on drugs], belonging to Mithridates, into Latin."[61] If letters of advice did go from Asclepiades on the subject of antidotes, then Pliny probably had the Latin rendering of the whole collection—including Asclepiades' letters—before him. A similar process of amalgamation may be behind the cryptic reference in Pliny which reads, "Chamomile is most highly commended by Asclepiades."[62] Pliny then proceeds to give a prescription very much like that in Dioscorides,[63] after giving his readers six various names applied to chamomile, while citing only Asclepiades at the beginning of the section. He tells us that doctors make lozenges from the pounded leaves, blossoms, and even the roots. The drug is effective "against every sort of snake."[64] Even less can be deduced from the fragments of Asclepiades' antidote recipes as they are found in Galen.[65]

Much more remains of Asclepiades' recipes for mixtures to treat external problems, presumably derived from his writings of these subjects which appeared in great numbers.[66] Especially valued were his prescriptions for drugs that were intended for oral cavity and throat problems. Galen passes on a formula for a cough medicine from Asclepiades that contains Pontic rhubarb, Cilician crocus-saffron, opium, frankincense, myrrh, Celtic nard, and storax, all "administered with honey mixed with wine."[67] The cough medicine prescription appears in a collection Galen (or some compiler who put this piece under Galen's name) had made of such recipes from Crispus the Freedman, and Scribonius Largus. Asclepiades' concoction, given by Galen, is rather aromatic, and contained most likely the dried stigmata of *Crocus sativus* L., olibanum which is the gum-resin from several trees of the genus *Boswellia* (frankincense), the gum-resin from *Commiphora* spp. (myrrh) of certain shrubs of Arabia and East Africa, an aromatic substance made from *Nardostachys Jatamansi* DC. (various types of nard, including Spikenard) commonly used in classical pharmacy,[68] and a sweet smelling oleo-resin produced from the inner bark of *Liquidambar orientalis* Mill. (storax). Opium was the analgesic, and its use and production had been

recorded by Asclepiades, long before Galen put down *his* account.[69] Pontic rhubarb was widely used in classical antiquity for its pungency,[70] and the honeyed wine made the whole quite palatable.

Asclepiades chose with care his prescriptions. His cough syrup would have some salutary effect. Olibanum is still useful as a stimulant expectorant as well as in the common incense. The stigmata of *Crocus sativus* L. sometimes are employed in the treatment of asthma. Myrrh remains useful as an effective astringent and tonic, and has some use for treatment of oral cavity diseases in mouthwashes. Storax was thought good for treatment of inflammation of the mucous membranes in general. Patients would have been grateful for this recipe, and Galen records it with some respect.

The modern scholar owes most of the extant material from Asclepiades to Galen and Caelius Aurelianus. Robert Thom's painting (above) offers an artist's reconstruction of a scene showing Claudius Galen preparing a cold cream for a patient. (From the Parke-Davis *Great Moments In Pharmacy* series.)

Scribonius Largus records a detailed recipe for an arterice, the general and common name applied to medicine for the windpipe.[71] He writes that there is "no better arterice than the one which is given by our own Asclepiades, who is one of the more capable men in all of his statements, and, especially in whatever injury there might be in the trachea (*in arteria*)."[72]

> It is composed of the following: the best fatty myrrh, by weight, 23 denarii;[73] white tragacanth, by weight, 28 denarii; root of the licorice, by weight, 28 denarii; resin of true terebinth, by weight, 28 denarii.

Further on the preparation of the arterice, as put down by Asclepiades, include pounding the tragacanth, straining it through a sieve, taking the crushed myrrh and mixing again each part of the two substances for a long time until they became as one. Then one ground them together in a mortar, and when "they will become hot by the stroke of the pestle, then, little by little, mix in the terebinth until they are all made as one."[74] Then comes the addition of the licorice which has been pounded and passed through the sieve. "One ought to sprinkle gradually it into the mixture. When these things will have been well

mixed, and while the drug is hot, much of it can be made, and some added, into little pills (*pilulas*) about the size of beans."[75] Largus now speaks on his own behalf, having quoted Asclepiades. "This arterice becomes, in fact, very hard, and in this itself it excells all the others, because it does not dissolve quickly while it lies under the tongue, and thus produces its effect for a long time."[76]

As an aromatic throat lozenge, Asclepiades' arterice again contains substances that were beneficial for the purposes stated. The myrrh, as in Galen's quotation above, is good for oral diseases, and the licorice (*Glycyrrhiza glabra* L.) is an excellent demulcent and expectorant. Mixed with fifty parts of water, the tragacanth (*Astragalus gummifer* Lab., and other spp.) forms a gummy substance which soothes mucous surfaces. The "true terebinth" (*Pistacia terebinthus* L., turpentine) oil is occasionally used as an expectorant.

RUFUS of Ephesus, a physician of great skill who practiced in Rome in the reign of Trajan (A.D. 98–117), has left an interesting recipe from Asclepiades on "stones of the throat." It is clear in this instance, as in the other cited recipes, that the Asclepiades given by Rufus, is not Asclepiades Pharmakion, since the latter physician is specifically named and cited in another section.[77] The Greek text of this passage is an excellent example of Asclepiades' repute in later antiquity (the section is recorded in Book XI of Aetius of Amida, physician of Justinian's reign, A.D. 527–565; Aetius has extracted it from Rufus, who, in turn, took it from Asclepiades' works), as well as his range and skill as physician and pharmacologist. The passage runs:

From Asclepiades, with reference to those suffering from stones: a powder of the balsam tree fruit, when the stone is found in the glands of the throat; juice of the pennyroyal, marsh mallow seed, "soda" (*nitron*); having pounded each in a mortar and having sifted it, put it away in storage, and give, as required, one spoonful with three ladlesful of diluted wine.[78]

The balsam "fruit" could be any one of several varieties from the genus *Commiphora*, all of which produce a fragrant, oleo-gum resin employed in healing mucous membrane inflammations, and as a general wound healer and expectorant. The pennyroyal (*Mentha pulegium* L.) is a common aromatic stimulant of folk medicine. Marsh mallow seeds (*malaches agrias spermatos* in the Rufus text, the same as the usual *alathaia: Althaea officinalis* L.), leaves, and roots are dried and make up a syrup and demulcent useful in mouth and pharynx irritations. The *nitron* is somewhat puzzling, until it is recalled that the Romans did not distinguish "soda" from potash, which is impure potassium carbonate, the Salt of Tartar (K_2CO_3, water soluble), used in skin diseases. *Nitron* as "soda" becomes saltpeter, either potassium nitrate (KNO_3) or sodium nitrate. Potassium nitrate is used in asthmatic powders combined with stramonium leaves. The ingredients make good sense, in light of the pharmacopaea of the time.

"Stone in the tonsils" suggests something of Asclepiades' own practice, and rather well refutes Wellmann's assertions that Asclepiades avoided the "nuisance of patients."[79] Anatomically, as is known from Galen,[80] *ho spongos* would include all the "spongy substance" in the throat: the tonsils, the various glands, and the remaining tissue which can become swollen and inflamed. This means *ho spongos* would include both tonsils and adenoids, as part of Waldeyer's ring of lymphoid tissue that encircles the nasopharynx and oropharynx. The diagnosis of "stone in the throat" of Asclepiades is possible through personal examination only, in

several ways. Digital palpation of the nasopharynx can reveal adenoid hypertrophy, which is firm and something like a "stone." Swelling of the lymph nodes at the ramus of the jaw in acute tonsillitis is another possibility. Acute tonsillitis also has the "diphtheritic membrane" sometimes over the gland, and is occasionally spotted yellow, and could, by eye, be mistaken for something like a "stone." The probability, however, is a true tonsillolith, or the more common salivary calculus. In all of the potential diagnoses, Asclepiades would have to come to his conclusions through personal observation. Indeed, he had patients.

The Rufus passage also uses terms, having to do with drug compounding, that Asclepiades had invented. He apparently was the first to use *katapastos* in its specific meaning of being "sprinkled or being spattered and being suitable for use as a powder" in pharmacy.[81] Likewise, he coined the specific meaning for *kopteon*, "one must pound drugs."[82] The peculiar sifting of drug-powders also was used by Asclepiades first, in the specific *setho*.[83] It is little wonder that he was regarded as the best example of Greek medicine to arrive in Rome by those who knew him, and by authors like Largus and Celsus who quoted him in the early years of the Empire.

Asclepiades was a great believer in sternutatories, if Caelius Aurelianus has quoted accurately. In delirium, he administered sneeze-inducers and errhines like "pepper, soapwort, and white hellebore."[84] In what Caelius Aurelianus calls lethargy, Asclepiades prescribed castor, rue "and vinegar, and also cow-parsnip, fleabane, and agnus castus as well as bayberries."[85] Better yet would be "a mixture of powdered mustard and vinegar," and that would work best "as a plaster for the head."[86] On a milder side, however, he prescribed a simple poultice called *omelysis* for women and children with tetanus,[87] which would also be good for the throat. *Omelysis* turns out to be small bags containing hot bran or raw flour.[88]

Celsus probably gives Asclepiades a more balanced treatment than does Caelius Aurelianus. Celsus calls Asclepiades, "the most excellent *auctor*,"[89] and does not emphasize errhines in Asclepiades' prescriptions and suggestions for throat troubles. Rather, we read that "he said that very sour vinegar should be sipped; by this means, the ulcers are lessened without doing damage. But although vinegar can slow the bleeding down, it is not able to heal those same ulcers. Better for this purpose is lycium, and Asclepiades commended this substance also in equal manner, or leek, or marrubium juice, or almonds pounded up with tragacanth and mixed with raisin wine, or flax-seed pounded and mixed with sweet wine."[90]

The substances listed by Caelius Aurelianus are, indeed, rather stiff, a great contrast to the Asclepiadean materials found in Celsus, Galen, Largus and Rufus. Pepper would cause sneezing without much doubt. Soapwort (of the genus *Saponaria*) must be meant here as some kind of binding agent, or used as a detergent, or, perhaps Caelius Aurelianus does not fully understand his pharmacopoea. The white hellebore was *Veratrum album* L., but most commonly used was *Helleborus niger*, "black hellebore," which has a digitalis-like effect on the heart, and can function as a cardiac and arterial tonic, diuretic, and cathartic. Fleabane (as Drabkin, p. 144, renders *conidia*), agnus castus (the "Monk's Pepper Tree:" *Vitex agnus-castus* L.) and bayberries (the fruit of *Laurus nobilis* L.) rest in that class of antispasmodic drugs. Vitex was once

thought to be a powerful aphrodisiac. Castor (the dried preputial follicles of the beaver, *Castor fiber*, from two inguinal sacs) appears elsewhere in Asclepiades' pharmacy, and the stench may have served to identify the preparation as "medicinal." Rue (the leaves of *Ruta graveolens* L.) functions as a carminative and rubefaciant. Vinegar is one of Asclepiades' favored all-round remedies, and sounds genuine. The combination of vinegar with mustard as an external remedy (a plaster for which Asclepiades was famous) is historically valid. Mustard (dried ripe seeds of *Sinapis alba* L., and *Brassica nigra* (L.) Koch, has a minimum of .6% allyl isothiocyanate, depending on temperature, altitude, and so on) was used as an emetic, rubefacient, and condiment. Caelius Aurelianus is correct in grumbling about such remedies, but one may wonder why these remedies could be so unlike other sources on Asclepiades' drugs. Possibly compilers, who put together much of the material that appears under the names of Soranus (in the renditions of Caelius Aurelianus) and Galen, had conflated many authors beyond individual recognition.

Celsus' listings are more to the point, and are consistent with other Asclepiadean recipes. Again, vinegar appears, a substance as common in Asclepiades' prescriptions as wine. Lycium may be the juice of the boxthorn (*Lycium barbarum* L.), but there is much controversy over lycium, or *lykion*, as in Dioscorides, I, 100. Opinion leans against the genus *Lycium* and now favors *Rhamnus* spp., perhaps *R. cathartica* L., or *R. infectoria* L. Lycium's use and function seem uncertain. Leek (*Allium Porrum* L.) is a relative of the onion. Horehound juice, (*Marrubium vulgare* L. as in Dioscorides, III, 105) becomes an expectorant in candy form, and a diaphoretic. Almonds, like the leek, are foodstuffs, and tragacanth, as noted in the Largus passages above, is used as a soothing agent for inflamed mucosal linings. Flax-seed is the common linseed, made into oil and then mixed with sweet wine, as contrasted to the resin-wine mentioned previously. Wine and vinegar, leek and horehound, and almonds: generally beneficial and directed to the purpose at hand. One must, therefore, use the materials in Caelius Aurelianus with some caution, since they have a unique character all their own in regard to Asclepiades. It may be that the fifth century writer has recorded materials and recipes missed or omitted by earlier compilers, but it is more probable that Caelius Aurelianus inherited a confused textual tradition as well as a hostile view of Asclepiades. The fifth century is well within the era dominated by Christianity, a general outlook that has little tolerance for mechanistic, accidental hypotheses about life, death, and the gods. Nearer to the truth are Celsus, writing in the reign of Tiberius (A.D. 14–37), Scribonius Largus in the time of Claudius (A.D. 41–54), and Galen (*c.* A.D. 130–*c.* 200). These three authorities cite Asclepiades with respect, even though all three differ from him in outlook and direction.

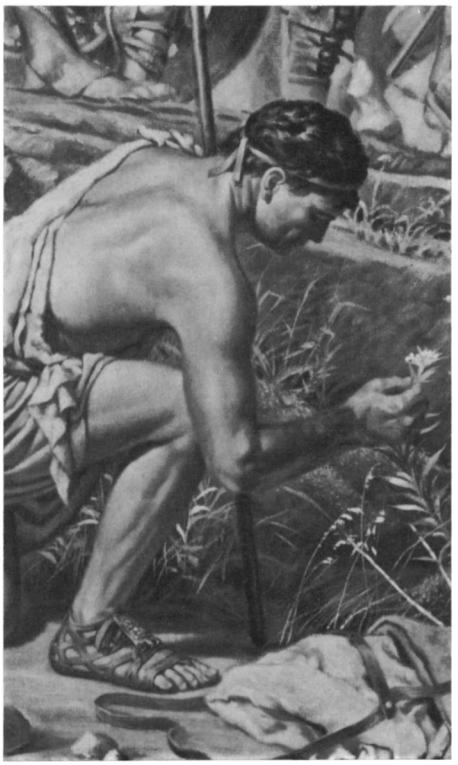
Related to Asclepiades' drugs for throat affections were his preparations for ear and nose disorders. Nasal polyps were of great concern to the Romans, and there are traces of Asclepiades' recipes and advice for their treatment.[91] Ear malfunction often was due to cerumen accumulation, and the doctor always had a good ear scoop among his tools.[92] Celsus records one of Asclepiades' "general remedies" for ear cases,[93] and there are fragments of a similar prescription from Asclepiades in Galen.[94] Whether or not Celsus speaks for

himself, or whether he is quoting Asclepiades' words in saying that the recipe is "one approved by experience,"[95] the prescription is consistent with other known Asclepiadean ingredients. The remedy put together by Asclepiades was:

> Cinnamon and casia, by weight, one denarius each;[96] flowers of the round *iuncus*, castor, white pepper, long pepper, cardamon, and myrobalanum, by weight 2 denarii each; male frankincense, Syrian nard, fatty myrrh, saffron, and *nitrum*, by weight, 3 denarii each. Pound separately, then mix with vinegar, and pound it all again to preserve it. To use it, the mixture will be diluted again with vinegar.[97]

Ingredients in this prescription, which have not appeared in the recipes of Asclepiades, cited previously, include two kinds of cinnamon, *iuncus*, cardamon, and myrobalanum. Castor, pepper, frankincense, nard, myrrh, saffron, and *nitrum* (Greek *nitron*, "soda") have all been delineated in other prescriptions. Medical cinnamon came from the inner bark of *Cinnamomum Loureirii* Nees., "Saigon Cinnamon," and was used as a cordial (well in line with Asclepiades' liking for alcoholic mixtures) and carminative. This type of cinnamon is not the spice, *Cinnamomum zeylanicum* Nees., "Ceylon Cinnamon."[98] The second kind of cinnamon (*casia*, Greek *kasia*, undetermined) listed by Asclepiades in his ear remedy, is some other type of cinnamon used in classical antiquity specifically in perfumes (as in Largus, XXXVI, and Pliny, XXXVII, 78. 204). *Iuncus* or Cyperus is an unknown rush, probably related to the English Galingale (*Cyperus longus* L.) which has astringent and aromatic roots. Cardamon is the dried ripe fruit or seed of *Elettaria cardamomum* (L.) Maton. (of India and Ceylon) and is employed as a carminative. Myrobalanum (Greek *myrobalanon*), sometimes rendered as "behen-nut," was made from the fruit of *Moringa pterygosperma* Gaertn., a palm tree, and gave an oil as recorded in Pliny, XII, 46. 100. Vinegar is again Asclepiades' general medium. The salve would be soothing and would smell rather exotic.

Salves and plasters were Asclepiades' favored treatments, when food and wine did not cure. For cardiac disease, which he defined as an "inflammation in the heart" according to Caelius Aurelianus,[99] Asclepiades made up a mixture containing pepper, sulfur, cachry, gum ammoniac, silphium, and old Sicyonian olive oil. In addition, he prepared plasters with silphium and undesignated bulbs, and used them as dusting powders as well. A combination



Dioscorides, first century AD investigator of drugs, quoted Asclepiades as an authority in his writings. (Detail from "Great Moments In Pharmacy," courtesy of Parke-Davis).

of quicklime and pepper was attributed to him for treatment in the same disease.[100]

THIS entire section in *Acute Diseases* is an apparent multi-combination of many sources, since "Asclepiades among others" prescribe the materials. Similarly, the quotation from Asclepiades' *Celerum vel acutarum passionum* ("Swift Illnesses") in *Acute Diseases* (III, 4. 34) is such a composite that one is left in doubt who indeed the author might be. The section is devoted to the treatment of sore throats (*synache*), and we read that Asclepiades had used bloodletting, bowel purges, various poultices, mouthwashes, gargles, and ointments. The salves had ingredients like hyssop, marjoram, thyme, melilot, wormwood, figs, *nitrum*, stavesacre, centaury, elaterium, ox bile, and cedar oil. Bloodletting was generally opposed by Asclepiades, and bowel purges were used only rather as a last resort—before beginning new drug therapy. *Nitrum* and the liberal use of wine throughout the treatment for both sore throats and heart trouble is accurate. Of the remaining ingredients, one is of interest in its own right: silphium. In *Acute Diseases* (II, 38. 219), it is classed under "pungent foods" like garlic and other pickled fare. Widely used in Greek and Roman pharmacy, silphium came from Cyrenaica and figured on coins from that area's cities, suggesting its importance in commerce. The plant remains something of a mystery, since it became extinct sometime in the Roman period.[101] Cyrene and Barca may have practiced a carefully harvested monopoly with it, and the chaotic years of the late Hellenistic period (150–30 B.C.) may have led to overharvesting and silphium's eventual extinction in the first or second century of the Roman Empire. From Asclepiades via Caelius Aurelianus, we can at least determine that silphium was in the plant class with garlic, because of its fetid and nauseating odor. Dioscorides (III, 80) places it among general herbs, with Melanthion (*Nigella sativa* L.) and *sagapenon* (*Ferula persica* Willd.). Perhaps Cyrene and Barca overfarmed their unique resource.

Galen (XIII, 341) gives a salve-recipe from Asclepiades as excerpted by Marcellus. Fortunately, Celsus gives the same recipe, and we can gain a good view of Asclepiades' skills in compounding what today might be called a skin-softener. It is recommended for a myriad of problems: it is an emollient for the liver and spleen, abscesses, scrofulous tumors, parotid swellings, etc.

Opopanax, storax, galbanum, resin, by weight, 2 denarii each; ammoniacum, bdellium, wax, beef fat, dried iris, by weight, 4 denarii each; cachry, one acetabulum;[102] 40 peppercorns, all pounded with ointment of iris to the correct consistency.[103]

The prescription gives some new ingredients from Asclepiades that are worthy of consideration. Opopanax is a fetid gum-resin obtained from the roots of *Opopanax Chrionium* (L.) Koch, a yellow-flowered umbelliferous plant that resembles the parsnip. It grows in the Near East and the Balkans, and was used in perfumes and soaps. Storax has received attention above, in the cough medicine of Asclepiades, quoted from Galen (XIII, 67). Galbanum is the gum-resin from a Syrian plant, *Ferula galbaniflua* Boiss., and used as a local counterirritant. Ammoniac is the resinous gum traditionally obtained from a "tree near the Temple of Ammon in Egypt," but which comes from the plant of western Asia, *Dorema Ammoniacum* Don., and is used as a counterirritant in the form of an Ammoniac Plaster. Classical sources confuse this kind of ammoniac with Sal

Ammoniac (NH_4Cl), the "Salt of Ammon," an opaque, crystalline salt, supposedly prepared from camel dung near the Temple of Jupiter Ammon in Egypt. This is the Muriate of Ammonia, used in tinning iron and in pharmacy, and in the manufacture of ammonium for the dyer. Pliny (XXXI, 39. 73 and 79) seems to confuse this with some salt pits of Sicily, while Asclepiades (in Galen, XII, 410) makes careful distinction in his suggestions for the treatment of alopecia.

Bdellium is the fragrant gum from *Commiphora africana* Endl., a common adulterant of myrrh. The wax comes from bee honeycombs, which contain myricin, cerin, melissic acid, heptacosane, and hentracontane, used in the preparation of salves, ointments, and plasters. Iris is sometimes used as a cathartic (*Iris florentina* L.). Cachry is the catkin of a nut-tree (Greek *cachros*) or willow, and is an ament, a spike of the unisexual apetalous flowers, normally displaying scaly, deciduous bracts. Peppercorn is the dried berry of the black pepper (*Piper nigrum* L.), frequently used as a condiment. The salve would be beneficial, or as Celsus notes in his clipped manner, would be "useful."

IN AN EXTENDED fragment of Asclepiades' *On Alopecia* (in Galen, XII, 410-413), various drugs are prescribed along with some bizarre treatment. *On Alopecia* is worthy of detailed consideration in its own right, but one may profit from a rapid overview of the methods and ingredients prescribed by Asclepiades. *Aphronitron* ("washing soda"), along with rock salt (the *halos ammoniakou*) appear first, followed by sharp vinegar, then made into a plaster. The doctor needs "no other drugs ... unless the bald spot is of truly a great size."[104] He then suggests shaving, which is "opposed by others," Galen's only comment.[105] More drugs follow for the serious varieties of alopecia. Asclepiades recommends a "dry-land basil [or hedgehog?], a burned seahorse, a small amount of *nitron*, having been mixed with goose fat; having cleaned it all beforehand, smear the alopecia with it."[106] More substances follow. Mouse dung, emulsified with vinegar, the ashes of burned Reed of Cyprus, and a combination of fly-blood and *nitron* completes his treatment. In modern treatment of mange (alopecia; baldness), small areas of the scalp are sometimes lacerated and then an injection of 1% triamcinolone acetonide is administered. This is, of course, not what Asclepiades had in mind when Galen writes, "Asclepiades recalls something about flies. Catching them, he ordered immediately that as many of their heads as possible be pressed into the bald areas of the alopecia, especially, he says, when we lacerate it."[107] It may be that Asclepiades had noticed improvement in bad cases of mange when small pricks were made in the skin, and the smallest, sharp parts he could think of were the flies buzzing around. Galen makes no comment about the treatment itself. Its inclusion, however, means implicit approval of the method. The plasters (*malagmata*) invented by Asclepiades —like the one at the beginning of the section on mange—are quoted in great numbers by Galen, who will occasionally take other collections of recipes and include them in his own books.[108]

In the prescriptions reviewed, there are seventy different substances, in a total of 116 citations of materials. Forty-nine are listed once, while sixty-seven have two or more listings. In the multiple citations, wine and vinegar have eighteen, plant foodstuffs have seventeen (with various grains having six within this

class), animal products (animal fat, castor, etc.) have seven citations, minerals have eight (with *nitron* in five cases), and insect products (wax, honey) have three. The following have two each: ammoniac, cachry, castor, rue, resin, honey, horehound, saffron, frankincense, storax, nard, tragacanth, figs, and cinnamon. Four references are given to myrrh, and three are devoted to silphium. The remainder are given to various inedible substances, like the one citation of opium and so on. Dominating Asclepiades' pharmacopoea is wine, verifying the Roman name for him, "The Wine Giver." Vinegar supplies him with a constant diluting agent. Most ingredients, however, fall into the categories of foodstuffs—expected from his medical dietetics, or generally harmless (when used carefully) aromatic materials derived from plants. Exceptions are the opium and hellebore, cited once each, and the latter may be suspect in the text of Caelius Aurelianus, perhaps derived ultimately in a garbled way from Asclepiades' letters to Mithridates. Minerals form a small minority, and the *nitron* comprises five of the eight entries. Asclepiades' drug lore thus falls within the normal pharmacy of classical antiquity, represented at its best by Theophrastus and Dioscorides, and Asclepiades.

THE NUMEROUS parallels in Dioscorides' *Materia medica* to some of Asclepiades' recipes show that Dioscorides valued Asclepiades' materials—or at least the approaches to pharmacy his immediate successors followed. Celsus thinks Asclepiades' medicine was usually quite sound, and quotes him with great respect. Scribonius Largus believes he was one of the finest practitioners of medicine in the recent past, and Pliny frequently lists him as one of his "foreign authorities." Rufus of Ephesus quotes Asclepiades, notably from one of the prescriptions, and the great polymath and physician of the second century, Galen of Pergamon, quotes Asclepiades very often, even while fuming at his mechanistic views. In the fifth century, Asclepiades is cited side by side with the revered Soranus, one of the best gynecologists of any age, and Asclepiades left traces in later Byzantine medical works. Widely respected and quoted in antiquity, his influence was eclipsed by Galen, who set the system of medical theory for a millennium.

Interest in Asclepiades was revived in the seventeenth and eighteenth centuries, when physicians rediscovered his remarkable insight into medical practice, an insight that fit well into the skeptical time that produced Edward Gibbon and many other anticlerical intellectuals. The overriding mood, however, both after Galen and following Gibbon's century (his *Decline and Fall of the Roman Empire* first appeared in 1776), was against the accidental "Epicurean" medicine represented by Asclepiades. He gave too much of the knowledge of medicine in forms that were easily understood by his patients. In the last century of the Roman Republic and in Galen's time—as well as our own—the vast majority of patients demand the feeling that their doctor really is smarter than they are, and, more importantly, that the physician indeed functions as did the medicine man of deep antiquity. For all of his brilliance, Asclepiades demanded too much of his patients. He demanded that they think for themselves, and taught that much they feared was simply created within and reinforced from without by convention.

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15. Gundel in *Der kleine Pauly*, II, 731, as in the preceding note.
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26. Pliny, XXVI, 7. 13.
27. Galen, XIV, 631, and XVIII, 2, 40 (Kuhn).
28. Celsus, III, 4. 2.
29. Celsus, *Prooemium*, 11.
30. Loeb Classical Library edition of *De medicina*, II, xi.
31. *e.g.* Galen, XIV, 135-146, beginning with Περὶ τῶν ὑπ' Ἀσκληπιάδου γεγραμμένων κατὰ τὸ ἑ. τῶν ἐντὸς παφῶν, ὁ Ἀσωνος ἐπιγράφεται, which appear to be five books by Asclepiades on internal remedies for

poisons, as excerpted by otherwise unknown Asonus.
32. Scribonius Largus, p. 3 (Helmreich).
33. *Ibid.* Viderit Asclepiades, quid senserit.
34. *Ibid.*, pp. 3-4.
35. *Ibid.*, p. 4: Vides ergo, quam non placeat Asclepiadi usus medicamentorum, cui nisi plura quis ad quoque genus vitii medicamenta conposita habeat ...
36. G. Helmreich suggests this in his introductory remarks (n. 7, pp. iv-v) to his edition of the *Conpositiones* (Teubner, 1887).
37. Celsus, *Prooemium*, 49, 54, and 69, seem to suggest reading Greek texts. Spencer lists other passages in his edition of *De medicina* (Loeb), I, xii.
38. Scribonius Largus is cited by Galen (in Greek) in XII, 683, 738, and 764; XIII, 51, 67, 99, 280, 284, 314, 737, and 930.
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42. *Anonymus Londinensis*, XXIV, 30-31 (Jones). Galen, XIX, 373.
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46. Galen, *On the Natural Faculties*, I, 13 (trans. A. J. Brock, Loeb, p. 65). Galen (Kuñn), II, 40.
47. *On the Natural Faculties*, I, 13 (p. 64 Loeb; slightly altered from the Brock rendition on the facing page).
48. *Ibid.*
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53. *e.g.* Galen, XIII, 108 (from Antonius Musa); XIII, 967-976 (on Asclepiades' plasters mixed with those of Heras and Dioscorides, from Lucius, Marcus Telentius Asclepiades, and Heras); XII, 730 (on Asclepiades eye remedies from Marcellus and Herocleides); XII, 684 (an extract from Asclepiades' work on external remedies, esp. nasal polyps, as culled by Meges).
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55. Pliny, XXIII, 29. 60-61.
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62. Pliny, XXII, 26. 53.
63. Dioscorides, III, 137.
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66. *e.g.*, Galen, XIII, 313, 355, 524, 535, 855, 903, 932 and 936.
67. Galen, XIII, 67.
68. Dioscorides, I, 7-9, gives four varieties.
69. Galen, XIV, 138.
70. Alexander of Tralles, *Opera*, II, 521, 525, 527, 573, and 577 (Puschmann)
71. Vitruvius, I, 6. 3. Celsus, V, 25. 17.
72. Scribonius Largus, LXXV (p. 32 Helmreich).
73. Scribonius Largus, p. 6 (Helmreich) explains the system he will use for weights and measures: Erit autem nota denarii pro Graeca drachma: aeque enim in libram ℔ octoginta quattuor apud nos, quot drachmae apud Graecos incurrunt. This means that 84 denarii will equal a Roman pound (librum), the same system for drug measures employed by Celsus, V, 17. 1C. I have chosen to render the weights in their Roman terms, but W. G. Spencer, II, lxv)-lxvii of his edition of *De medicina* (Loeb) chooses to convert the Roman terms into modern metric equivalents. The librum (pondus) was equal to about 336 grams, and the denarius (and the Greek drachma) to about 4 grams. An acetabulum consisted of about 63 cubic centimeters. The symbol, P, followed by a numeral (in Celsus, and, since the system is the same, in Scribonius Largus) means *pondus* (librum), one or more; P without a following numeral is *pondo*, "by weight." ℔ followed by a number is one denarius or more.
74. Scribonius Largus, LXXV (p. 32 Helmreich).
75. *Ibid.*
76. *Ibid.*
77. Rufus of Ephesus, *Opera*, 579 (Daremberg-Ruelle).
78. Rufus of Ephesus, 574. The "ladle" in the translation is an Attic measure (the cyathus, about ½ pint, equal to 2 konchai or "shellsfull," in turn equal to 4 mystra or "spoonsful"). The "ladle" measure is employed in Galen, X, 516, and XIX, 753, and the "spoon" is in Dioscorides, III, 22, and Galen, XIII, 57 and XIX, 770.
79. M. Wellmann, "Asklepiades," *RE*, II, pt. 2, 1632: "... Verbesserung des Lagers u. drgl. einfache Mittel heilte, unnötige Quälerein der Kranken vermied..."
80. Galen, XIX, 140.
81. Galen, XIII, 159.
82. Galen, XIII, 341.
83. Galen, XIII, 324 and 342.
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87. Caelius Aurelianus, *Acute Diseases*, III, 8. 90.
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90. *Ibid.*
91. Galen, XII, 684.
92. Scarborough, *Roman Medicine*, plate 33.
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96. For the measuring-system, see note 73 above.
97. Celsus, VI, 7. 3A-B.
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102. See note 73 above.
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105. Galen, XII, 413.
106. Galen, XII, 413-414.
107. Galen, XII, 414.
108. *e.g.*, Galen, XIII, 341-342.

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Gnosticism, Drugs, and Alchemy in Late Roman Egypt

by John Scarborough*

THE CONFUSION of late Hellenistic Jewish thought shrouds the origins of Gnosticism, but there is general agreement that several elements were important in its summary form, reached in the third and fourth centuries. Gnosticism arose from a complex combination of Hellenistic philosophy, Iranian religious teachings, Christian offshoots, and heterodox Judaism.[1] Those thinkers who espoused Gnosticism in the early Christian centuries were devoted to an interpretation of Divinity and its relation to man that taught a sort of pre-cognitive Knowledge (*gnosis*) as well as mythology which freed men from the shackles of belief in astrology, the tyranny of Creation, Old Testament law or any law, and even the god of the Old Testament.[2] The relation between God and sin, and between man and sin, mark the major themes in the fantastic cosmologies of the various Gnostic sects.

A Supreme God was transcendant, and He induced emanations that resulted in a number of inferior gods, which the Gnostics called Aeons. The Aeons were attributes of the Divinity, but in this group of celestial beings (*pleroma*) sin occurred which brought about the fall of one of the lesser gods. The discredited god then created the material world, including man, who reflected the transgression of his faulty creator (a *demiurge*). Man, therefore, had to separate his soul from the error-prone casing of the body. Christian Gnostics thought this could come through the Divine *Logos* ("Reason") seen in Christ incarnate as Jesus. Jesus, in turn, provided *gnosis* to comprehend the *pleroma*.[3] Divinity gave the revelation of *gnosis* through an experience of ecstacy which arrived "through the eyes of the soul."[4]

Hermetic, quasi-medical, and mystic philosophical works were, from the very first, part of the

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Gnostic tradition.[5] Stoicism provided Gnostics with solid arguments for a *logos*,[6] and hints of alchemical material occur quite early in Gnostic history.[7] Stoicism received many non-Greek concepts into its thinking, particularly those from Babylonia, and the Stoic teacher Poseidonius (*c.* 135-51 B. C.) allowed astrology to become an acceptable portion of Stoic thought. Although later alchemical and gnostic writers garnered much from Stoic doctrines, the alchemists firmly rejected astrology and its implications of predestination.[8] Drug lore was also entrenched within alchemical thought, and the alchemists' desire to gain insight into transmutation principles was coupled with collection of pharmaceutical recipes from Dioscorides and Galen.[9]

Although alchemical lore is supposed to have arisen with the Greek philosopher, Democritus,[10] formal definition of the secrets and objects of alchemy did not occur until sometime in the first and second centuries within the matrix and concepts of Gnosticism.[11] A mysterious Pseudo-Democritus put down a collection of recipes in the first century,[12] and the book was divided into four parts: how to make gold, silver, gems, and purple.[13] Behind Pseudo-Democritus was an ancient tradition of craftsmen's notebooks, and bits of information from Egypt, Persia, and Syria are apparent in his *Physica et mystica.* [14] The craft-tradition with its practical emphasis is undervalued as the treatises look to the transmutation of matter. Metals changed colors in alloy processes, and Pseudo-Democritus sought methods of tingeing, tinting, varnishing, and alloying one metal to make it appear like another, in particular to make a base metal resemble gold.[15]

Alchemical tradition recorded the names of Iamblichus, Moses, Ostanes, and Isis, practicing transmutation in the first and second centuries. The names are pseudonyms with the exception of Iamblichus,[16] and he is not identical with the better-known writer of the same name.[17] The nature of alchemical literature is well illustrated by the remnants of "Moses" and "Ostanes." The opening section of one of Moses' works is a garbled version of *Exodus* XXXI, 2-5, and the work is attributed to the Hebrew sage. It seems "Ostanes" was suggested by the Persian name of the teacher under whom Democritus supposedly studied.[18] Other writers before Zosimus of Panopolis (*fl. c.* A.D. 300) include Maria "the Jewess," Cleopatra, "Hermes," and "Agathodaemon."[19] Zosimus believed in the authenticity of Maria and Cleopatra's works, and he records enough of their purported material to give us a fair indication of alchemy as it existed in the third and fourth centuries. Through Zosimus, we note that Maria was very practical in her approach to alchemy, and she supposedly invented most of the processes used by later alchemists.[20] For example, she originated an elaborate 'kerotakis' apparatus, a hot ash bath, a dung bed, and water bath, an apparatus for liquid distillation that remained standard in alchemy for 2000 years, and description of alloys of copper and lead.[21] Cleopatra bequeathed to Zosimus materials

that were less 'practical,' but nonetheless influential. Her *Chrysopoeia* survives only as a page of symbols and drawings which include the serpent Ouroboros (devouring his own tail), a sketchy distillation apparatus, and the 'kerotakis' apparatus for metal fixing.[22] Mystical writing is further infused into alchemy with "Hermes," probably not related to the mystical works under "Hermes Trismegistus," but are from priestly works of "Hermes-Thoth."[23] "Agathodaemon" completes the trend toward Gnostic thought within alchemy, and the remnants of his materials suggest contemporary Gnostic hymns.[24]

Throughout all this literature, there are definite links to drug lore, particularly when the pre-Zosimus writers treat substances like alum, natron, ochre, honey, gum, milk, bile, urine, and numerous vegetable products, already well-delineated in Dioscorides and Galen.[25] The tone of fairly rational approaches to metals, alloys, and drugs, noted for Pseudo-Democritus, has passed into something different—a kind of reverence for the mysterious and poetic essence that will appear to selected mortals who then will taste divine beauty and know the way of Truth.[26] Gnosticism taught inner worlds and alchemy was imbued with esoteric meaning and expression, as opposed to exoteric action, by the beginnings of the fourth century. Zosimus did not contribute much that was original to alchemy,[27] but he created a masterful synthesis of alchemy and its current form, wrapped as it was in the sparkling ribbons of Gnosticism, Stoicism, and drug lore.

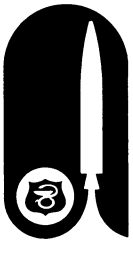
The first reliable documentation for Graeco-Roman alchemy occurs with Zosimus' writings, which are produced in the developed matrix of Gnosticism as it was taught in fourth-century Egypt.[28] Zosimus composed an alchemical encyclopedia (the *Cheirokmeta*) which has reached us in Greek and Syriac segments.[29] Gnostic argument permeates Zosimus' writing as he offers the alchemical "Way of Understanding" in contrast to other ways, particularly astrology and magic.[30] Typical of the diffuse obscurity in alchemy by Zosimus' day is his *On Divine Water*.[31] From the text, it is impossible to determine anything about the nature of the 'divine water,' which seems to have the power to dissolve or disintegrate substances used by alchemists, and it had the power to color metals. Perhaps it was also volatile and gave a vapor that attacked metals, and sometimes mercury or solutions of hydrolized sulfides are meant by 'divine water.'[32] Plant juices have the property of tinting metals, according to another treatise by Pseudo-Democritus,[33] and many of the terms, clearly given by the earlier author, now become mystical and all-encompassing.[34]

Hidden among the various mysterious allusions to the power of transmutations and their formulas —known and comprehended only by the initiated—are disguised recipes which represent a tradition of pharmacology separate from better-known Byzantine or Arab drug lists.[35] In later Byzantine medicine and pharmacology, the study of drugs in their own right was unknown. The doctor acted as his own druggist, and physicians followed the tradition of Galen, who

sought far and wide for good healing agents that ranged from plants to ores.[36] Medical writers in the Byzantine tradition as Oribasius, Aetius, Paul of Aegina, and Theophanes Nonnus, drew up lists of remedies which listed those drugs manufactured professionally as well as those classed as household remedies.[37] This tradition is historically connected with origins in Greek and Roman medicine, but the fusing of drug lists with alchemical symbolism wends an extremely complicated path until it emerges for a short time in the alchemy and drugs of al-Razes, and then, much later, in the iatrochemistry and alchemy of the Renaissance.[38]

Much as Gnosticism failed to gain many adherants after the fourth century, so the amalgam of alchemy, Gnosticism, and drug lore did not influence many thinkers outside the esoteric circles of initiated alchemists. Zosimus borrows heavily from earlier drug lists as do his predecessors, to suffuse something of the properties of drugs and *their* changes into general concepts of alchemy. Pharmacological recipes had a minor, but important place, in how alchemists conceived of the mysterious properties of ores and calcination, but the healing qualities of given remedies were submerged in a plethora of generalizing formulae which set forth the hope of making the "base into perfection." Later Byzantine commentators noted half-hidden connections, but they seemed to have missed the importance of earlier analogies that gave drugs properties usually reserved for 'minerals' and the like.

In sum, the alchemical-drug tradition, which took its origins in Roman Egypt, did not exert great influence except in a guarded manner and even that tendency became more and more obscured under the layers of mystical confusion. Under the impact of Gnosticism, alchemy adopted a changed direction, away from a technical craft, best seen in Pseudo-Democritus, and directed its efforts into the foggy channels of the quest for the Philosopher's Stone. Any advances promised in the early history of alchemy toward technical understanding of the chemistry of mineral compounds, drugs made from earth matter, and the basic metals, was effectively thwarted by the questions alchemists asked after Zosimus. They came in the form of "how do we go from the base to the perfect in nature," and such tendencies smothered development above the level achieved by Maria. On the other hand, alchemy *did* perfect a number of processes by which certain metals could be made to resemble other metals, but since such changes did not always last, alchemists continued to seek better combinations and secrets. The partial success blinded them to other approaches which waited until the nineteenth and twentieth centuries to be exploited.



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25. See the general suggestions that Zosimus may have borrowed more from Galen than is usually noticed, in M. Berthelot, "Sur les voyages de Galien . . . .," *Journal des Savants* (1895), 382-387 (full citation of article in note 9 above). The various lists of materials that alchemists considered useful in their work (*e.g.* Berthelot, *Collection*, III, 4-17) contain many references to pharmaceutical matter. Throughout the Greek texts, particularly those of later "commentaries" that were written in Byzantine times, are scattered, crabbed references to drugs known to Roman physicians. A few references will suffice here. Dioscorides (ed. Wellmann), II, 82: on Attic honey, followed in Berthelot, *Collection*, III, 11; Galen (ed. Kühn), XII, 168-178: on Galen's trips to Lemnos and Cyprus to procure a kind of reddish clay stamped into pellets (an iron oxide which Galen used for curing lethal poisons and bites of mad dogs), followed by Zosimus as quoted by Berthelot in *Journal des Savants* (1895), 382-387; Dioscorides, II, 70 (similar to Rufus of Ephesus (ed. Daremberg-Ruelle), 314, 486, 491, 543, and Galen, XII, 263-269): on milk, followed by Berthelot, *Collection*, III, 67 ("Synesius" who gives 'milk' mystical meanings; the text seems to be derived from Dioscorides or Rufus and Galen); Dioscorides, V, 106: on alum, followed in Berthelot, *Collection*, III, 171-174 ('alum' becomes something in between cinnabar and arsenic sulfide, with mystical language attached); the numerous references in Galen to the various "biles" (*vid.* Galen, IX, 460, XII, 276, XVII, 2, 271, among many: black bile, yellow bile, red bile) have become adapted into alchemical terms in Berthelot, *Collection*, III, 196(Zosimus), where 'shades' of metallic 'yellow' are emphasized with the 'bile' analogy. Taylor, *Journal of Hellenic Studies*, L (1930), 123-124. The alchemists heavily plagiarised Dioscorides, V, 74 sq. ("Metallic Stones"), which included descriptions of *kadmeia* ('calamine'), *chalkos kekumenos* ('burned copper'), *molubdos kekaumenos* ('burned lead'), *psimuthios* ('white lead') and many more that we meet in the alchemical literature.
26. Berthelot, *Collection*, III, 228-246. Here Zosimus narrates the confused connections between the Jewish, Christian, and Egyptian religious traditions and how they contribute directly to the mystical art of alchemy. *Collection*, III, 239-241, contains some important passages where Zosimus links Egyptian "gnosis" with the Way of Truth. The context suggests the setting of general Egyptian Gnosticism, both Christian and non-Christian.
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33. Zosimus, "Substances Amalgamating Tinctures" (Berthelot, *Collection*, III, 150-151.
34. There seems to be confusion whether "Agathadaemon" or "Democritus" wrote down the ideas, according to Zosimus.
35. Within Berthelot's *Collection*, there are fragments of some of these commentators. Philosophus Christianus (early sixth century), Stephanus (c. 610-641), Philosophus Anonymus (seventh or eighth century), Michael Psellus (1018-1078), Cosmas (c. 1000), and Nicephoras Blemmydes (thirteenth century) are representative names in the list (*vid.* Taylor, *Journal of Hellenic Studies*, I (1930), 121-123, for summary of contents).
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INVITATION

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To help the Program Committee in the selection of the papers, an abstract not exceeding 200 words, should be submitted to the Chairman of the Section *before December 1, 1971.*

Authors of papers (who need not be members of the Institute) should observe the following guidelines:

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3. An original typescript, a carbon copy, and any illustrations for publication purposes, should be submitted to the Secretary upon delivery of the paper at the meeting. (One copy will be returned to the author, within six months, if the Institute cannot publish it within a reasonable time. Until a manuscript is thus released the AIHP retains priority upon publishing it.)

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find himself facing a demanding scientific challenge," contend Roy A. Bowers and David L. Cowen in their concise history of continuing education in pharmacy at Rutgers. (*Rutgers Pharmacy Newsletter*, Fall 1986, 1, 6.) Rutgers was the first American college of pharmacy to set up a full-time pharmacy extension service in 1950.—G.H.

SPECIAL BIBLIOGRAPHIES IN THE HISTORY OF PHARMACY—I

The Institute encourages scholars to submit bibliographic essays for this occasional section of In the Literature.

Texts and Sources in Ancient Pharmacy

by John Scarborough

After a lengthy hiatus, there is a revival of interest among classical scholars and historians of pharmacy and medicine in the particulars of ancient drug lore. Recent listings of published studies in the Society for Ancient Medicine and Pharmacy *Newsletter* suggest an ever-increasing probing of the sources and texts of ancient Near Eastern, Greek, Roman, and early Byzantine pharmacy, and a major component of these studies is an attempt to identify various species of medicinal products, ranging from the expected herbal preparations to animal products and pharmaceutically active minerals. Many scholars are now exercising commendable care as they suggest modern nomenclatures and interpretations of properties through physiological biochemistry, a care that is coupled with clear admonitions that antiquity always had its own manner of "understanding" the properties of medicinally active drugs. The work of John M. Riddle, Ann Hanson, Vivian Nutton, Klaus-Dietrich Fischer, Jerry Stannard, Michael Harstad, Emilie Savage-Smith, Jacques André, M.-H. Marganne, and several other scholars representing the international character of ancient medical studies, has begun to explicate important specifics of ancient pharmacy, and there is certain to be an increased interest in the subject by graduate students in Classics, History of Medicine, History of Pharmacy, History of Science, and ancient history generally. Since there exists no annotated listing of the primary texts (mostly Greek and Latin) of ancient pharmacy, the following is presented as an aid and guide to further research.

It must be remembered that drug lore functioned as an integral portion of ancient medicine as a whole, and that the practice of medicine—however defined—almost always included knowledge of beneficial and harmful *pharmaka*, much as indicated in Homer's *Iliad* and *Odyssey*, the earliest documents reflecting an emerging Greek civilization in the seventh century B.C. Modern "pharmacy" as such did not exist, and the physician counted his command of drug lore as one of the most important tools of his (or her) trade. Even when one finds tracts devoted particularly to drugs in classical antiquity (e.g. by Dioscorides or Scribonius Largus), the authors are first and foremost physicians seeking to describe pharmaceuticals; the best of them also attempt to bring some order into a usually chaotic drug lore, and Theophrastus' hopes of classifying herbs through the methods of folk medicine was supplanted by Dioscorides' "drug affinity" system or by long alphabetical lists of plants and drugs as seen in the pages of Galen and Paul of Aegina. Except for Theophrastus, certain writers among the Hippocratic physicians, Galen, and the early Byzantine physicians, concepts of a "drug theory" do not loom large, so that the modern scholar is occasionally forced to make assumptions from current philosophical notions in antiquity or presumptions "taken for granted" in the texts of folkloristic drug lore, exemplified by Theophrastus' oral

sources, the *rhizotomoi* ("rootcutters"), or by the traditions of old Egypt which dominate the Greek and Coptic texts of the *Papyri Graecae Magicae.*

Ancient Near Eastern Drug Lore

Few published texts of the cuneiform tracts on medicine and pharmacy have appeared, but those that one can employ suggest the venerability of certain plants employed as drugs, from frankincense and myrrh to henna and saffron. Drugs of occasionally uncertain identity are common in Akkadian medical texts, nicely summarized in transliterated texts and French translations by René Labat, *Traité Akkadien de diagnostics et pronostics médicaux* (Paris and Leiden, 1951; 2 vols.), and should one wish to tackle some of the cuneiform texts themselves (in Assyrian), one can puzzle through the published texts in R. Campbell Thompson, *Assyrian Medical Texts from Originals in the British Museum* (London, 1923; rptd. New York, [?] 1977). Thompson publishes the Assyrian cuneiform texts without commentary or translation, but his "Preface" lists scholarly effort which had gone into the cuneiform medical works before 1922. Labat's plentiful bibliographic citations will also lead into more recent studies. J. V. Kinnier Wilson, *The Nimrud Wine Lists* (London, 1972), 74–76, suggests other cuneiform texts which have been published in limited numbers in scattered specialist journals.

Compared to the dearth of published sources of ancient Mesopotamian medicine and pharmacy, there is much a student can analyze in similar texts from ancient Egypt. Most famous is the Edwin Smith Papyrus, generally devoted to surgical techniques, but which contains many pharmaceuticals as parts of treatments. Dated to about 1800 B.C., this text is in Hieratic, an abbreviated form of Hieroglyphic, and it was published in a fully restored Hieroglyphic text with translation and commentary by James Henry Breasted, *The Edwin Smith Surgical Papyrus* (Chicago, 1930; 2 vols.). A primary document for ancient Egyptian drug lore is the Ebers Papyrus, first rendered into German by H. Joachim as *Papyrus Ebers* (Berlin, 1890), but a vastly improved translation appeared in English by B. Ebbell as *The Papyrus Ebers, the Greatest Egyptian Medical Document* (Copenhagen, 1937). Dated to about 1300 B.C., the Ebers Papyrus is stuffed with plants and animal products employed as drugs, and the prominence of myrrh, frankincense, saffron, iron oxides, ox bile, crushed wasps, and hundreds of other pharmaceuticals indicates a very sophisticated (and very poorly understood) medicinal pharmacy among Egyptian physicians in the eighteenth Dynasty. Unhappily, the commonly-cited Cyril P. Bryan, trans., *Ancient Egyptian Medicine: The Papyrus Ebers* (London, 1930; rptd. Chicago, 1974) is a very badly translated English text from the poor translation in German by Joachim, so that the would-be student of ancient Egyptian pharmacology is best served by avoiding the Bryan translation. Most valuable, however, among modern editions and translations of Egyptian medicine as a whole are the various volumes of Hermann Grapow, *et al., Grundriss der Medizin der alten Ägypter* (Berlin [East], 1954–1973; 9 vols. in 11 parts). All major texts are published in Hieroglyphic in Vol. 5, Herman Grapow, *Die medizinischen Texte in hieroglyphischer Umschreibung* (Berlin, 1958), and one may locate particular pharmaceuticals as transliterated and cross-indexed to the various papyri in Vol. VI, Hildegard von Deines and Hermann Grapow, *Wörterbuch der ägyptischen Drogennamen* (Berlin, 1959). Vol. IX is *Ergänzungen* by Hildegard von Deines, Hermann Grapow, and Wolfhart Westendorf (Berlin, 1973), and incorporates the very useful "Die Drogenquanten," again cross-indexed to particular papyri. A German translation of all the medical texts is in Vol. IV, part 1, *Übersetzung der medizinischen Texte*, as rendered by von Deines, Grapow, and Westendorf (Berlin, 1958). The editors' methods of subdividing the papyri according to "classes" of illnesses and treatments may prove confusing initially, but with the careful cross-indexing system, a student can quickly learn to refer back and forth among the several volumes involved in this massive and scholarly encyclopedia of Egyptian medicine and drug lore. Coptic nomenclatures for plants often prove decisive in identifying ancient Egyptian herbal preparations, and one may profitably consult Walter C. Till, *Die Arzneikunde der Kopten* (Berlin [East], 1951) on this aspect of Egyptian botany. Less medical but still very helpful for special plants employed in Egyptian drugs is Renate Germer, *Flora des pharaonischen Ägypten* (Mainz am Rhein, 1985). Succinct surveys of some of the drug lore of ancient Egypt, as well as listings of secondary works in French, German, English, and Italian, are in

Paul Ghalioungui, *The House of Life, Per Ankh. Magic and Medical Science in Ancient Egypt*, 2nd ed. (Amsterdam, 1973 [esp. ch. 10: "Materia medica and dispensing"]) and *idem. The Physicians of Pharaonic Egypt* (Mainz am Rhein, 1983).

Strangely understudied by historians of pharmacy is the rich trove of data extant from the deep traditions of the ancient Hebrews, best observed in references to drugs contained in the Old Testament. The vast compilation of rabbinical discussion and comment as incorporated into the Talmud (embodying the Mishnah, the oral teaching of the Jews, and the Gemara, the collections of discussions on the Mishnah) is replete with specific pharmaceuticals, only superficially quarried by Wilhelm Ebstein, *Medizin im neuen Testament und im Talmud* (Stuttgart, 1903; rptd. Munich, 1975), 169–191 ("Heilmittel") and Julius Preuss, *Biblical and Talmudic Medicine*, trans. by Fred Rosner (New York, 1978; original German text published 1911), 443–447 ("Materia Medica"). Preuss does include a number of recipes incidentally in his descriptions of various diseases (e.g. "Diseases of the Eyes," 259–284, and "Skin Diseases," 323–374), but the resources of the Talmud and Mishnah remain to be explicated in terms of drugs and drug lore among the ancient Hebrews. Good translations into English are available of both the Talmud and Mishnah: I. Epstein, ed., *The Babylonian Talmud* (London, 1935–1952; 35 vols.), and Herbert Danby, trans., *The Mishnah* (Oxford, 1933; last rptd. 1980). Cross-linguistic equivalencies quite often reveal a living drug lore, as practiced in antiquity, and the Greek translation of the Hebrew religious texts by a traditional committee of 70 scholars in Hellenistic Alexandria is a valuable text suggesting how Hebrew (and probably Aramaic) plant names were rendered into the Greek of the third or second centuries B.C. Commonly known as the Septuagint, this Greek translation of the Hebrew 'Old Testament' is available in several well-edited texts and English translations, the most widely employed remaining that by L. C. L. Brenton, ed. and trans., *The Septuagint with Apocrypha* (London, 1851; last rptd. 1980). Two older, brilliant "dictionaries" of plant names will provide many of the exact references into Talmudic and related texts: Immanuel Löw, *Aramaeische Pflanzennamen* (Leipzig, 1881) and *idem. Die Flora der Juden* (Vienna, 1924–1934; 4 vols.). The scholarly tools are in place, the texts in Hebrew, Greek, Aramaic, and occasionally Syriac are generally in reasonable well-edited and published form, and yet there is no comprehensive study of ancient Hebrew pharmacology. This is certainly a desideratum to be accomplished by a future historian of ancient medicine and pharmacy.

Greek Pharmaceutical Lore

Although there is some evidence to suggest that earlier Mycenaean practices in spice lore and possibly pharmacology survived into Greek medical thinking (for which *vid.* Cynthia Wright Shelmerdine, *The Perfume Industry of Mycenaean Pylos* [Göteborg, 1985]), Greek civilization and culture had its own peculiar manner of asking questions about the world of nature and how man fit into that world. Homer's *Iliad* and *Odyssey* (an oral form of these epics was probably standardized by about 800 B.C.) signal these approaches with several mentions of drugs in their varied forms—from the "good" *pharmakon* to bad *pharmakon*, with this famous Greek word encompassing a full range of meanings from "magical spell" to "poison" to "beneficial remedy." The presence of itinerant healers in Homer's world of Greek Asia Minor in the seventh century B.C. (they are termed *dēmiourgoi*) suggests a continual infusion of magic and magicians into early Greek botany, agriculture, and medical pharmacology (for which *vid.* Walter Burkert, *Die orientalisierende Epoche in der griechischen Religion und Literatur* [Heidelberg, 1984]), as well as how continual debate characterized Greek concepts of "drug actions" on the several simultaneous levels of empirical observations and conclusions, religious custom, and pure magic and amuletic lore (for which *vid.* John Scarborough, "The Pharmacology of Sacred Roots, Plants and Herbs," in C. Faraone and D. Obbink, eds., *Accessing the Divine: Studies in Greek Magic and Religion* [Oxford, 1988 (in press)]). Scattered references of herbal plants and drugs occur (after Homer) in Hesiod's *Works and Days* (of about 700 B.C.), the Lyric Poets (Sappho, as an example), and in the poems of Pindar (518–438 B.C.) among many Greek sources. Athenian playwrights could assume the audiences of the tragedies and comedies staged in honor of Dionysus would know the names of common herbs, so that Aristophanes in the *Lysistrata* (411 B.C.) could make puns on the uses of European pennyroyal and Sophocles' *Rhizo-*

tomoi (Rootcutters) of about 441 B. C. could presume "everyone would know" the status and practices of these semi-professional herb-gatherers. Yet drugs remained simply an integrated aspect of medicine, without too much specialized comment, until the era of Aristotle (384–322 B.C.).

The first quasi-systematic survey of medicinals seems to have been made by Diocles of Carystos, a contemporary of Aristotle. Diocles combines medical botany with etiology, dietetics, and prognostics in medicine, and his work would repay serious attention. Enough has survived of his writing on pharmacology and dietetics to indicate the close relationship of botanical remedies with both medical practice and earlier philosophic theories as they filtered down into the fourth century B.C. A printed text of the Greek fragmentary remnants of Diocles' works was published by Max Wellmann, ed., *Die Fragmente der sikelischen Ärzte Akron, Philistion und des Diokles von Karystos* (Berlin, 1901), 117–207 [193 fairly extensive texts, quite frequently replete with pharmaceutical lore]. Slightly earlier than Diocles was Mnesitheus of Athens, who wrote extensively on medical dietetics and drugs, and Mnesitheus' works were frequently quoted in later medical compilations. What is left of Mnesitheus can be perused in the Greek texts, edited with French translations in Janine Bertier, ed., *Mnésithée et Dieuchés* (Leiden, 1972).

AMONG the students of Aristotle, Theophrastus of Eresus (about 370 to about 285 B.C.) has left his mark as the most brilliant of his master's successors in the Peripatetic School of philosophy. Theophrastus is noted for his *Inquiry into Plants*, the last book (Book IX) of which is the first complete herbal treatise to survive in Greek (for which *vid.* John Scarborough, "Theophrastus on Herbals and Herbal Remedies," *Journal of the History of Biology*, 11 [1978], 353–385). An incomplete Greek text and English translation is available in Arthur Hort, ed. and trans., *Theophrastus: Inquiry into Plants and Minor Works on Odours and Weather Signs* (London, 1916; 2 vols [Book IX: Vol. II, 217–321]). Victorian prudery caused Hort to omit some rather mild passages on aphrodisiacs and sexual suppressants as found in Theophrastus, *Inquiry*, IX, 18. 3–11, so that one must employ the Greek text of these sections, last edited by F. Wimmer, *Theophrasti Eresii opera* (Paris, 1866; rptd. Frankfurt am Main, 1964), 160–161 [with Latin translation]. An English translation (without commentary) has been rendered of these omitted sections of Theophrastus, *Inquiry*, IX, 18. 3–11: Chalmers L. Gemmill, "The Missing Passage in Hort's Translation of Theophrastus," *Bulletin of the New York Academy of Medicine*, 49 (1973), 127–129. Theophrastus' herbal botany was derived generally from oral sources, especially the semi-professional classes of *rhizotomoi* ("root cutters") and *pharmacopōlai* ("drug vendors") who hawked their wares at country festivals and city celebrations in fourth century B.C. Greece. It is from these folkmedical experts that Theophrastus derives a rather wobbly definition of "herb" as contrasted to an ordinary plant.

Drug lore appears only occasionally in the large number of writings under the name of Hippocrates (Hippocrates of Cos, *fl.* about 425 B.C.), and the most complete collection of Greek texts (with French translations) of the writings in the Hippocratic *corpus* remains E. Littré, ed., *Oeuvres complétes d'Hippocrate* (Paris, 1839–1861; 10 vols.; rptd. Amsterdam, 1973–1982 [a second reprinting]). Drugs do appear in certain of the Hippocratic treatises, e.g. the *Diseases III*, last edited (with German translation) by Paul Potter, *Hippokrates: Über die Krankheiten III* (Berlin [East], 1980 [*Corpus Medicorum Graecorum* I 2,3]), but the greatest concentration of drugs in the Hippocratic *corpus* occurs in the obstetrical and gynecological tracts, the *Diseases of Women, Diseases of Young Girls*, and *Nature of the Child* (ed. Littré, Vol. VIII, 10–233, and 466–473; and Vol. VII, 486–540). Perhaps one is reading the "data" of midwives and prostitutes, incorporated into the pharmaceutical lore of the anonymous authors of *Diseases of Women, Diseases of Young Girls*, and *Nature of the Child*, but until the publication of the re-edited Greek text and English translation of *Diseases of Women* by Ann Hanson (forthcoming in the *Corpus Medicorum Graecorum* series), one will have to wait for the latest scholarly judgment on the matter. It would appear, however, that much of the concept of "how drugs work" in the Hippocratic *corpus* derives from Aristotelian theory, for which *vid.* John Scarborough, "Theoretical Assumptions in Hippocratic Pharmacology," in F. Lasserre and P. Mudry, eds., *Formes de Penseés dans la collection hippocratique* (Geneva, 1983), 307–325.

[to be continued]

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would it support its own periodical? Undaunted, Lyman turned his attention more to questions of editorial content. With the help of a few influential members within the Association, such as Secretary-Treasurer Zada Cooper, Lyman succeeded in starting the Journal. Named as Editor, he made the Journal a reflection of his own strongly held opinions. (Moreover, Editor Lyman provided an important outlet for scholarly papers on the history of pharmacy.)

Sonnedecker's history of the founding of the AJPE is based primarily on the personal papers of Rufus Lyman, which are preserved in the Collections of the American Institute of the History of Pharmacy at the State History Society of Wisconsin. These collections also house the papers of other important figures in American pharmacy, such as Donald E. Francke, Frederick and J. Leon Lascoff, and Robert P. Fischelis.—G.H.

SPECIAL BIBLIOGRAPHIES IN THE HISTORY OF PHARMACY—I

The Institute encourages scholars to submit bibliographic essays for this occasional section of In the Literature.

Texts and Sources in Ancient Pharmacy (continued)*

by John Scarborough

Hellenistic Pharmacy, Toxicology, and Medical Entomology

A crucial watershed in Greek history was the remarkable career of Alexander the Great (King of the Macedonians, 338–323 B.C.), one of the greatest military geniuses of all time. Forcibly uniting the fractious Greek states under Macedonian rule, Alexander took his Greco-Macedonian army on an amazing campaign of conquest of the Persian Empire (which included most of Asia Minor, Syria, Egypt, Mesopotamia, portions of south-central Asia, and sections of western India), reaching the headwaters of the Indus River in 327 B.C. After winning against an Indian army, equipped with a cavalry of elephants in 326 B.C., Alexander and his exhausted troops retired to Bablyon, where the youthful general died in 323 B.C., leaving his enormous empire "to the strongest," according to Arrian, the best of the numerous 'Alexander-historians' of classical antiquity. The new conquests became 'Greek-like' states, and students of ancient history customarily designate Greek history before Alexander as "Hellenic," with the three centuries between the death of Alexander and the death of the last 'Greek' monarch of Egypt (Cleopatra VII in 30 B.C.) termed "Hellenistic," to indicate the striking contrasts between the cultural life of the narrowly constricted Greek states before Alexander's career, and the broadly based Hellenistic kingdoms of the Near East which exhibited a patina of Hellenic speech and customs, 'Greek-like' only in surface manifestations.

Yet in this historical and cultural context of Greek-speaking rulers in their small numbers dominating the millions of Egypt, Syria, and other areas of the Near East, there were erected lasting urban centers, resplendent in their Greek manners and cultural customs, from exercise grounds to centers of worship of the Greek gods of old. Greek became *the* language of commerce and learning throughout the vast sweep of territory from Macedon to India, and the new elites from the Greek homelands brought into Egypt, Syria, Mesoptamia, and even Bactria and India, the peculiar approaches of Greek philosophy, art, politics, literature, and science, now transplanted in the multinational and polylingual cities of Alexandria of Egypt, Antioch of Syria, Pergamon in western Asia Minor, and dozens

*Continued from *Pharmacy in History* 29 (1987):81-84.

of other Alexandrias rooted along the road of conquest to India. In Alexandria of Egypt, especially, the multifaceted culture called "Hellenistic" produced some of the greatest achievements of Greek science, and the Alexandrian Museum with its flanking libraries became legendary.

The heritage of Aristotle loomed large in several aspects of Hellenistic science and the medical arts, including pharmaceutical lore. Sometime around 250 B.C., a polymath named Apollodorus put down data on poisonous creatures, employing the time-tested methodologies of the Peripatetic School to classify snakes, scorpions, spiders, certain insects and similar animals deemed dangerous through their bites and stings. Apollodorus' *Poisonous Animals* has not survived, but this tract became enormously influential on later Greek and Roman efforts to comprehend pharmacological toxicology, with Apollodorus quoted by almost all writers on the topic from his own day until later Byzantine times. The few identifiable fragments of Appolodorus' work form part of the commentary and analysis by Otto Schneider, "Apollodorus' Iologorum Dux" in *Nicandrea* (Leipzig, 1856), 181–201, and there is evidence that Apollodorus also composed a treatise *On Poisons (Peri dēlētēriōn pharmakōn)*. For the complex textual history of Apollodorus' writings as used by other Hellenistic and early Roman imperial authors, one may still find value in Max Wellman, "[Apollodoros, der Iologe]" in Franz Susemihl, *Geschichte der griechischen Litteratur in der Alexandrinerzeit* (Leipzig, 1891–1892; 2 vols.), Vol. I, 784–785.

Poetic Sources

The impact of Apollodorus on Hellenistic toxicology is particularly evidenced in two extant, hexameter poems, the *Theriaca* and *Alexipharmaca* by Nicander of Colophon (*fl. c.* 140 B.C.). Deliberately modeled on the Homeric *Iliad* and *Odyssey*, Nicander's poems compact much of the data on medical entomology and toxicology gathered by Apollodorus a century earlier, and these poems show the incompetence of the poet while he purloins the accurate facts on cobras and centipedes, black widows and blister beetles, and many other creatures from the pages of Apollodorus. Nicander's *Theriaca* and *Alexipharmaca* have been re-edited and translated into English by A. S. F. Gow and A. F. Scholfield, *Nicander: The Poems and Poetical Fragments* (Cambridge, 1953), and one will find tentative suggestions regarding nomenclatures of plants and animals which embellish the Greek hexameters. Nicander also gives a fairly complete synopsis of known remedies for snake bites, scorpion stings, and antidotes for ingested poisons (for which *vid.* John Scarborough, "Nicander' s Toxicology, I: Snakes," and "Nicander's Toxicology, II: Spiders, Scorpions, Insects and Myriapods," *Pharmacy in History*, 19[1977], 3–23, and 21[1979], 3–24 and 73–92). Casting the facts of medical entomology and toxicology into hexameter lines of poetry may strike the modern pharmacist as rather odd, but this particular format enabled easy memorization, which may explain why Nicander's often obtuse poems became the "textbooks" on the subject from his own day through the early decades of the European Renaissance. Of course, even Greek and Roman readers were often puzzled by Nicander's terminologies, so that an extensive literature of commentaries on Nicander soon became part of the textual history of the *Theriaca* and *Alexipharmaca*. Marginal comments and suggestions in recopied manuscripts (that is what are called "scholia") of Nicander's works have come down to us in company with the actual poems, and these scholia have been published in freshly edited texts in their own right. Occasionally, the ancients were wildly guessing at obscure meanings in Nicander, but quite frequently the anonymous authors of the scholia have left us quotations of lost authorities, as well as lexical definitions which *do* clarify Nicander's often opaque coinages, so that consultation of the scholia becomes essential to comprehend Hellenistic toxicology and pharmacology as a whole. Published texts of the scholia to Nicander include Marius Geymonat, ed., *Scholia in Nicandri Alexipharmaca* (Milan, 1974), and Annunciata Crugnola, ed., *Scholia in Nicandri Theriaka* (Milan, 1971), but one may also employ the F. Dübner, ed., "Scholia" in *Scholia in Theocriti Idyllia* (Paris, 1878), 173–219. From time to time, Greek and Roman savants attempted "prose-paraphrases" of Nicander, and there is extant one such prose summary by an otherwise unknown Eutecnius (*fl.* before A.D. 512), whose Greek text has recently

This shallow Greek bowl, from about the 6th century B.C., shows the weighing, packing, and stowing of drugs, probably silphium. The bowl is now in the Cabinet des médailles, Bibliothèque Nationale, Paris.

appeared in two, freshly-edited and published editions: Isabella Gualandri, ed., *Eutecnii Paraphrasis in Nicandri Theriaca* (Milan, 1969), and M. Papathōmopoulos, ed., *Eutekniou Paraphraseis eis ta Nikandrou Thēriaka kai Alexipharmaka* (Iōannina [Greece], 1976 [with introduction in Modern Greek]). Eutecnius' prose versions show rather vividly the quandaries faced by ancient physicians and toxicologists, as they sought to untangle the "made up" terms of Nicander from the underlying data faithfully recorded by Apollodorus and other medical practitioners and pharmacologists of the Hellenistic era.

Another Hellenistic poet who has left us with glimpses of an active practice of medicine and knowledge of drugs is the famous Theocritus of Syracuse (*c.* 300–*c.*[?] 260 B.C.), best known for his *Idylls*, probably composed while the poet was resident in Alexandria. *Idyll* II bears the title *Pharmakeutria*, and is a revealing collection of folkmedicine and magical *pharmaka*, directed and applied for the specific purposes of sexual passions. An excellent Greek text, with fluid English translation and exhaustive commentary, comprises A. S. F. Gow, ed. and trans., *Theocritus* (Cambridge, 1952; 2 vols.). Like Nicander's lines, Theocritus' poems engendered an extensive ancient collection of marginal commentaries, so that one may also consult what Greek and Roman scribes thought Theocritus meant (obscure references, plant-identifications, and similar matters) in these scholia, best available in C. Wendel, ed., *Scholia in Theocritum vetera* (Leipzig, 1914; rptd. Stuttgart, 1967). Theocritus' botany, drug lore, and knowledge of medicine, have intrigued scholars for several centuries, with the most useful recent study by Kurt Lembach, *Die Pflanzen bei Theokrit* (Heidelberg, 1970); Lembach's bibliographical listings are a sure guide to the secondary literature on pharmacy, botany, medical magic, and folklore in Theocritus' poems.

Fragments

Much of what we know about Hellenistic physicians and pharmacologists emerges in lengthy quotations by later authorities (*e.g.* Galen of Pergamon [A.D. 129–after 210]), so that modern scholars are forced to piece together numerous fragments embedded as citations within extant writings in order to gain a notion of particular Hellenistic physicians' contributions, pharmaceutical expertise, and theoretical concepts. One knows, for example, about the fundamental research in anatomy and physiology by the renowned Herophilus and Erasistratus (both probably *fl. c.* 260 B.C.) at the Alexandrian Museum *only* through Galen's quotations of lost writings, or through similar citations in the Greek of Rufus of Ephesus (*fl.* in reign of Trajan [A.D. 98–117]), or in the Latin texts of Cornelius Celsus (*fl.* in reign of Tiberius [A.D. 14–37]), Caelius Aurelianus (*fl.* [?] A.D. 400), and several other medical authors of Roman imperial times. Collection of such 'frag-

ments' is often fraught with great difficulty, because later writers frequently cite several earlier authorities in a single block, and modern research on Hellenistic medicine and pharmacy must initially tease apart several 'quotations' jumbled together by later authorities.

Praxagoras of Cos (*fl. c.* 300 B.C.) was famous in classical antiquity as one of the greatest physicians, in company with Hippocrates. Ancient doxographies named Praxagoras as the teacher of Herophilus, and the study of drugs and their applications in various therapies was apparently quite prominent in Praxagoras' practice. His many works are lost, except for quotations, and these have been assembled and translated into English by Fritz Steckerl, *The Fragments of Praxagoras of Cos and his School* (Leiden, 1958); pharmacy figures heavily in the fragmentary remnants of Praxagoras' *Therapeutics* (Steckerl, 90–107). Fewer fragments are extant of Phylotimus (*fl.* [?] 280 B.C.) and Pleistonicus (*fl.* [?] *c.* 280 B.C.), but as students of Praxagoras both displayed interest and expertise in dietetics and pharmaceuticals, suggested by Phylotimus' tract, *On Food* (Frgs. Nos. 8–21 [Steckerl, 110–120]) and Pleistonicus' account of hellebore preparations (Frg. 6 [Steckerl, 125–126]). Diphilus of Siphnos (*fl. c.* 300 B.C.) was a widely respected expert on dietetics and drugs, but his lost writings (particularly *On Good and Bad Foods*) are quoted exclusively by Athenaeus of Naucratis in Egypt (*fl. c.* A.D. 200) in the long-winded and curious pot-pourri *Deipnosophistae* (something akin to *Learned Men at Dinner*), for which *vid.* John Scarborough, "Diphilus of Siphnos and Hellenistic Medical Dietetics," *Journal of the History of Medicine and Allied Sciences*, 25 (1970), 194–201. If our texts reflect the essential issues of Hellenistic medicine and pharmacy, it appears that there was a continual debate concerning what constituted a "drug" as contrasted to a "food."

An important summary of drugs and applications was composed by Evanor (*fl. c.* 300 B.C.) in a work titled *Therapeutika*, lost except for quoted passages in Galen, Caelius Aurelianus, Athenaeus, and the *Natural History* by Pliny the Elder (A.D. 23/24–79), for which *vid.* refs. in Wellmann in Susemihl, *Geschichte*, I, 783. It was, however, the famous "research" center at Alexandria, which consolidated much of the previously determined facts about therapies and physiological theory, as well as anatomy. Herophilus of Chalcedon is famed for his dissections and discoveries of human anatomical structures, but he also wrote extensively on drugs and dietetics (P. M. Fraser, *Ptolemaic Alexandria* [Oxford, 1972; 3 vols.], I, 353, and II, 518–521 [refs. and notes]), apparently to the point where he and his students never "... treated any illness without drugs" (Celsus, *De medicina*, V prooemium 1). No satisfactory collection of fragments of Herophilus' writings has been performed, although one may still employ C. F. H. Marx, *De Herophili celeberrimi medica vita, scriptis in medicina meritis* (Göttingen, 1840) with great profit, and the translated excerpts with commentary by J. F. Dobson, "Herophilus of Alexandria, "*Proceedings of the Royal Society of Medicine*, Sect. History, 18 (1925), 19–32, encompass the majority of important quotations. Herophilus' presumably younger colleague, Erasistratus, is best known for his work on human physiology and for his formulation of medical theory (for which *vid.* Leonard G. Wilson, "Erasistratus, Galen, and the *Pneuma*," *Bulletin of the History of Medicine*, 33 [1959], 293–314), but there is ample evidence that Erasistratus pursued the specifics of drug therapies and dietetics with a widely recognized influence, as explicated by Wesley D. Smith, "Erasistratus's Dietetic Medicine," *Bulletin of the History of Medicine*, 56 (1982), 398–409, and as suggested by the truncated Greek text in Robert Fuchs, "Eine neue Receptformel des Erasistratos," *Hermes*, 33 (1898), 342–344. As in the case of the fragments of Herophilus, no completely satisfactory assemblage of Erasistratus' remnants has been collected, but one may consult Robert Fuchs, *Erasistratea* (Berlin, 1892 [diss.]) and "De Erasistrato capita selecta," *Hermes*, 29 (1894), 171–203, for a reasonable summary of the main themes and problems. Many of the major fragments are translated by J. F. Dobson, "Erasistratus," *Proceedings of the Royal Society of Medicine*, Sect. History, 20 (1927), 825–832 [= Section of the History of Medicine, 21–28]. A lucid survey of the problems linked to assessment of the often jumbled fragments of Erasistratus is found in Markwart Michler, "Erasistratos," *Die hellenistiche Chirurgie*, Teil I: *Die alexandrinischen Chirurgen* (Wiesbaden, 1968), 93–94.

Buried among the hundreds of cited authorities in Galen, Pliny the Elder, Caelius Aurelianus, and several similar later writers in Greek and Latin, are names and occasional quotations of Hellenistic physicians and pharmacologists. Basic chronology for these individuals remains controversial, so that the dates suggested below are but "rough guesses," founded on the painstaking research of Wellmann, Michler, Fraser, and several other modern scholars. Philinus of Cos (*fl. c.* 250 B.C.) apparently wrote prolifically in both textual criticism on the works of Hippocrates and also on specific remedies for particular afflictions (*e.g.* a compound drug to treat labored breathing, a concoction including rue, iris, and cassia); the few extended fragments of Philinus' tracts have been expertly edited and published in Karl Deichgräber, ed., *Die griechische Empirikerschule*, 2nd ed. (Berlin, 1965), 163–164 [9 frgs., with Nos. 135–137 and 140–141 of special interest]. Serapion of Alexandria (*fl. c.* 225 B.C.) composed a *Therapeutikon* in three books, and one knows about Serapion mostly through quotations in the later Latin texts of Caelius Aurelianus (Deichgräber, *Empirikerschule*, 165–167 [9 frgs., Nos. 145–153]); Serapion was an early member of the new "Empirical School" of medicine, for which *vid.* Fraser, *Ptolemaic Alexandria*, I, 359–360, and II, 529–530 [notes and refs.; Fraser uses the spelling Sarapion]. Uniquely, we have a firm date for Andreas (of Carystos), personal physician to Ptolemy IV Philopator (King of Egypt, 221–203 B.C.); Andreas was murdered in 217 B.C., since he chanced to be where Ptolemy IV was supposed to be during an assassination attempt (Polybius, V, 81. 6). Andreas wrote several works on medicinal herbs and poisonous animals, quoted by Scholiasts on Nicander, Pliny the Elder, Galen, and others, for which *vid.* Wellmann in Susemihl, *Geschichte*, I, 817–818, and Fraser, *Alexandria*, II, 528 (sources and refs.). Another royal physician who left his mark on Hellenistic pharmacology and toxicology was Apollophanes of Seleucia, chief physician to Antiochus III (King of Seleucid Syria, 223–187 B.C.). Apollophanes was friend and confidant of his royal master, acting as diplomat and advisor along with his medical duties at the Seleucid court, and he probably kept a journal which recorded some of the complicated diplomacy between Ptolemaic Egypt and Seleucid Syria, as well as thoughts on the looming shadows of the imperial Roman Republic (for which *vid.* Truesdell S. Brown, "Apollophanes and Polybius, Book 5," *Phoenix*, 15 [1961], 187–195, and F. W. Walbank, *A Historical Commentary of Polybius*, Vol. I [Oxford, 1957], 584–585). Apollophanes composed tracts on plasters and other pharmaceutical preparations, and his *Theriaka* seems to have been widely quoted (*vid.* Wellmann in Susemihl, *Geschichte*, I, 822). Glaucias of Tarentum (*fl. c.* 175 B.C.) was expert in the use of drugs and wrote respected tracts on medical dietetics, suggested by Athenaeus' borrowing Glaucias' account of the properties of lettuce; Deichgräber, *Empirikerschule*, 168–170, publishes ten short excerpts from Glaucias' lost works, and Michler, *Chirurgie*, 101–103, summarizes what is known about Glaucias of Tarentum. One wishes more had survived of the pharmacological writings of Mantias "the Herophilean" of Alexandria (*fl. c.* 130 B.C.), since titles include *Properties (Dynameis)*, *The Apothecary at the Doctor's Stall (Pharmakopōlēs ho kat' iatreion)*, and *Cleansing (Peri kathartikēs)*, among several tracts which delineated drugs and their employment in medical therapies (for which *vid.* Michler, *Chirurgie*, 103–104; Wellmann in Susemihl, *Geschichte*, I, 825; and Fraser, *Alexandria*, I, 359, and II, 529 [notes and refs.]). Mantias became most famous as the teacher of Heracleides of Tarentum, one of the greatest physicians and pharmacologists of the Hellenistic era.

Heracleides of Tarentum (*fl. c.* 75 B.C.) was " . . . one of the most quoted doctors of the Hellenistic world" (Fraser, *Alexandria*, I, 361), and his high level of expertise on pharmacology commanded the respect of almost all later commentators, including the generally hypercritical Galen. The extensive fragments which have survived of Heracleides' works show him to be carefully schooled in drug lore (Galen says this was due to his teacher, Mantias), well educated in the finest of Greek literature and philosophy (suggested by the title of his major work on dietetics, *Symposium*), and certainly skilled in anatomy and surgical technique. Deichgräber, *Empirikerschule*, 172–202, publishes 78 frequently extensive fragments excerpted from Heracleides' *Pulses*, *Therapeutics*, *To Antiochis* (said by Galen to be the most important work on drugs and pharmacology), what Deich-

gräber labels "Die pharmazeutischen Fragmente" (Frgs. 192–202), *Antidotes, Cosmetics,* and the tract on medical dietetics, *Symposium.* Heracleides is clearly the most important pharmacologist between Diocles and the Aristotelians, and Dioscorides of Anazarbus (*fl.* A.D. 65); a study of Heracleides' drug lore would certainly add much to our knowledge of Hellenistic pharmacy, and elucidate some of the historical transitions of Greek pharmacology into its better known Roman form, as seen in the pages of Dioscorides and Galen. Deichgräber's published texts of the Empiric physicians also includes the summary (by Galen) of the basic concepts of pharmacology (*Empirikerschule,* 158–160 [Frgs. 126–130]), applicable to the drug lore of Heracleides of Tarentum. Fraser, *Alexandria,* I, 361–362, and II, 533–535 (notes and refs.) gathers the known data and collects the majority of useful bibliography on Heracleides.

Zopyrus of Alexandria (*fl. c.* 80 B.C.) seems to have been skilled in compounding styptics and in prescribing antidotes for poisons, and fragments of his writings on these and similar topics filter through the pharmacological doxography recorded in Galen. Deichgräber, *Empirikerschule,* 205–206, edits one major excerpt (Frg. 267: Galen quoting Apollonius Mys quoting Zopyrus) on antidotes, but merely lists the citations of seven quoted recipes from Zopyrus' works in the pages of Oribasius' *Medical Collection.* The compacted doxography in Galen's references to Zopyrus show that the traditions had recorded a link (by letter) between Zopyrus' knowledge of antidotes and the court of Mithridates VI of Pontus (King of Pontus, 115–63 B.C.). Mithridates is infamous in his own right as an "experimenter" (on living human beings) with poisons and antidotes, but Mithridates' chief physician, named Crateuas, was renowned as one of the finest botanical pharmacologists of his era (for which *vid.* M. Wellmann, *Krateuas* [Berlin, 1897]). Known as *the* Rootcutter (*Rhizotomos*), Crateuas quite probably was the author of one of the first illustrated herbals, setting a pattern followed in botanical manuals until the adoption of block printing in the European Renaissance. Oddly enough, although there are numerous references *to* the works of Crateuas, the only surviving direct quotations from his *Rootcutting (Rhizotomikos)* are from the famous and magnificent manuscript of A.D. 512, usually called the "Vienna Dioscorides," since the texts and illuminations of plants are of an alphabetical Greek version of Dioscorides' *Materia Medica;* the ten quotations were edited and published by Max Wellmann in *Pedanii Dioscuridis Anazarbei De materia medica* (Berlin, 1906–1914; 3 vols.), III, 144–146, preceded by 32 testomonia (139–144), chosen by Wellmann to suggest Crateuas' widespread influence. Manuscript illumination of plants (especially before the invention of the codex—our "book" form) is very much debated among scholars (for which *vid.* John M. Riddle, *Dioscorides on Pharmacy and Medicine* [Austin, Texas, 1985], 176–217), and Pliny's complaint (*Natural History,* XXV, 8) about the miserable and misleading paintings in works he has perused on medical botany, is most likely a mirror of reality (Crateuas is one of three authorities named in this particular context).

Zoology and toxicology were the special interests of Sostratus of Alexandria (*fl. c.* 30 B.C.), who seems to have provided one of the major accounts of the suicide of Cleopatra VII, who—as everyone recalling Elizabeth Taylor's motion picture portrayal or the words of Shakespeare will know—induced an Egyptian asp to bite her. Sostratus authored *On Striking and Biting* [Animals] and a general zoological tome, *On Animals,* but his major concern apparently was poison-lore, hearkening back to the tracts on toxicology by Apollodorus in the third century B.C. One is tempted to place Sostratus within the gloomy last years of the Ptolemaic court, but Fraser's carefully worded, " . . . Sostratus . . . apparently lived to recount the death of Cleopatra" (*Alexandria,* 363), reflects exactly our basic uncertainty regarding Sostratus' association with the final days of Cleopatra. It is clear, however, that Sostratus was well read in the toxicological literature (for which *vid.* M. Wellmann, "Sostratos, ein Beitrag zur Quellenanalyse des Aelian," *Hermes,* 26 [1891], 321–350, and Fraser, *Alexandria,* II, 537 [notes and refs.]); Wellmann, "Sostratos," 346–349, edits and publishes 18 fragments from the lost writings *Striking and Biting Animals, Animals,* and what Wellmann terms "Aus seinen medicinischen Schriften." Poisons and antidotes would be primary concerns among rulers and monarchs, continually guarding against assas-

sination, and study of the drug lore of the Hellenistic kingdoms before the coming of Roman dominion reveals the definite role played by physicians, pharmacologists, and their drugs in the swirling levels of political intrigue.

[to be continued]

ADDENDUM:

Ancient Mesopotamian Drug Lore [*vid. Pharmacy in History*, 29, No. 2 (1987), 82]

Following the implicit judgment of Robert Biggs, "Medicine in Ancient Mesopotamia," *History of Science*, 8 (1969), 94–105, one hesitates to suggest the compilations of proposed nomenclatures of Assyrian herbs, plants, and mineral drugs as published by R. Campbell Thompson. Biggs warns that philological understanding of the languages written in the cuneiform is gradually improving, but that many specifics (especially exact names for plants) remain in the realm of conjecture, or are based on necessarily wobbly comparisons with Arabic, Hebrew, Syriac, Aramaic, Coptic, and other better known Near Eastern languages. Moreover, Thompson's books are exceedingly rare, so that only wealthy collectors or large university libraries would afford access to these fascinating—if unhappily doubtful—collections of pharmaceutical data from ancient Assyria. Nonetheless, it seems appropriate to list Thompson's admittedly pioneering efforts to explicate the herbal lore of ancient Assyria, while also issuing a strong caveat against trusting totally Thompson's identifications.

Thompson produced three major works on Assyrian herbal lore, botany, and what he called "chemistry": R. Campbell Thompson, *The Assyrian Herbal* (London, 1924 [reproduced by handwritten mimeograph stencils, with printed title page by Luzac; 294 pp. of stencils]); R. Campbell Thompson, *On the Chemistry of the Ancient Assyrians* (London, 1925 [reproduced by typewritten stencils, with printed title page by Luzac; 158 pp. of stencils, with handwritten Greek, Syriac, Arabic, Hebrew, and Aramaic + six printed plates of cuneiform texts]); and R. Campbell Thompson, *A Dictionary of Assyrian Botany* (London, 1949 [published postumously by the British Academy]; all cuneiform transliterated). Thompson also published a series of translations, which may prove enlightening: "Assyrian Prescriptions for Diseases of the Feet," *Journal of the Royal Asiatic Society* [no vol. number] (1937), 265–286 and 413–431 [the editor of the *Journal* has appended " . . . a list of works by the same author on similar subjects . . . " (431–432), which include several other translations by Thompson on medical topics]. Biggs, "Medicine in Ancient Mesopotamia," 103–105, provides a bibliographical listing of more recent scholarship, and among his citations are a number of translations into German, French, and English.

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Herbs of the Field and Herbs of the Garden in Byzantine Medicinal Pharmacy

John Scarborough

Among scholarly studies of Byzantine gardens are a number that provide details about what plants were grown and why they were cultivated as a common practice. Yet little attention has been paid to the botanical and pharmacal particulars of Byzantine garden lore. Moreover, even less well known are the all-season plant gatherers of the Byzantine Empire, plant collectors who continually augmented the herbal drugs of the monasteries. By focusing on some aspects of the gathering of wild specimens, which were, in many ways, "taken for granted," one receives a rather different picture of Byzantine botanical lore than if research depends solely on evidence drawn from gardens.

An interested student or scholar wishing to inquire about the essentials of herbalism in the Byzantine Empire likely will be led into the Greek texts on gardens, well illustrated by the Christian "dream garden" as published in Greek, with a French and now English translation, by Margaret Thomson.[1] Within are, indeed, the expected fruits and vegetables, sweet smelling and pleasantly verdant, along with some descriptions of "how to plant a garden." Presumably technical names, however, are not intended as a guide for the reader, but rather suggest how an ideal garden would appear. For example, in Thomson's text is the "knowledge of *smilax,*"[2] and one reads an ethereal account of the possible shapes of such a tree, but nothing one could designate as "practical." Thomson's notes on *Jardin,* 21, indicate biblical allusions, but nothing concerning botanical, agricultural, or medical utility. *Smilax* here is a tree (*to dendron*), so that one need not bother to consider other plants with the same name, for example, the cowpea or cherry bean as described by Dioskorides,[3] or the European sarsaparilla first noted by Pliny the Elder and Dioskorides,[4] probably drawing information

[1] M. H. Thomson, ed. and trans., *Le jardin symbolique* (Paris, 1960); and *The Symbolic Garden: Reflections Drawn from a Garden of Virtues. A XIIth Century Greek Manuscript* (North York, Ont., 1989).

[2] *Le jardin symbolique,* 68–77; *The Symbolic Garden,* 86–95.

[3] *Vigna unguiculata* L. = V. sinensis Endl., the cowpea or cherry bean, as in Dioskorides, *Materia medica,* 2.132 and 146 (Greek text ed. M. Wellmann, *Pedanii Dioscuridis Anazarbei De materia medica,* 3 vols. [Berlin, 1906–14; repr. Berlin, 1958], 1:132 and 146).

[4] *Smilax aspera* L., Dioskorides, 4.137 and 142 (ed. Wellmann, 2:282–83 and 285–86). Pliny the Elder, *Natural History,* 16.163 and 24.82–83. The common source is probably the lost tract on medical botany by Sextius Niger (fl. probably early 1st century).

from a common source; nor does one need to posit the infamous scammony (occasionally called *smilax*) with its well-known cathartic resin.[5]

Two trees are possible: *Taxus baccata* L., the so-called English yew, renowned in medieval Asia Minor for its heavy and hard, yet elastic, wood (thus the English "yew-bow" of folklore[6], and, second, the ever-popular tree of an enchanted grove, the holm oak (*Quercus ilex* L.),[7] with its prickly, hollylike sucker-shoot leaves. Centuries earlier, Theophrastus had remarked that the name is "Arcadian," and since Thomson's text leaves little doubt about the fairy-tale purpose of the anonymous writer, it seems clear enough that this famed "dream garden" manual is just that: an imaginary world of fragrances and wafting breezes, of pruned shapes and colorful flowers and equally colorful fruits edible only with the nose and eyes. Thomson attributes this "garden of the imagination" to the eleventh century,[8] and there is an ancestry in similar tracts of pagan antiquity, such as those published by A. Delatte in the *Herbarius.*[9] Delatte's texts retail the plants of medical astrology, with seven major kinds of plants linked with planets also of extremely important ceremonial use and prominence in mythology.

Yet this genre of the "dream garden" manual represents only one facet of Byzantine garden lore and herbalism. Too often, moderns ignore other types besides this religio-mystical "symbolism" of specific plants: Thomson herself had called attention to other and varying traditions of more practical utility in her seldomly cited *Textes grecs inédits relatifs aux plantes,*[10] texts in themselves supplementary to those on botany (and other topics) as edited and published earlier by Delatte.[11] Important is Thomson's section of Greek texts (with French translations) of botanical lexicography,[12] paralleled by Delatte's fifteen botanical glossaries,[13] only slightly emended by J. Stannard.[14] Delatte's glossaries include one by a Pseudo-Galen,[15] nine by anonymous authors, one by a Pseudo-Symeon Seth,[16] and one each by Neophytos, Nikomedes, and Nicholas Hieropais, followed by Thomson's Greek text of a "Lexicon of Arabic Plant Names,"[17] leading into several more tracts of similar content and with the obviously intended purposes of pure lexicography. These are not the vaguely perceived or

[5] *Convolvulus sepium* L. is the most common, cosmopolitan species of scammony, still used in Greece, Turkey, and Syria as a powerful cathartic. In some botanical guides, the plant bears the name *C. scammonia*. Why *Smilax,* in ancient Greek botanical nomenclature, should sometimes take the place of *skammonia* is a lexicographical mystery. The scammony's main pharmaceutical action is its properties to cause large amounts of bodily fluids to be evacuated, which explains why many modern herbal manuals describe it as a "diuretic."

[6] Dioskorides, 4.76 and 79 (ed. Wellmann, 2:88–89 and 92–93). Pliny the Elder, *Natural History,* 16.51.

[7] Theophrastus, *Historia plantarum,* 3.16.2; Pliny the Elder, *Natural History,* 16.19.

[8] Thomson, *Le jardin symbolique,* 10–11; *The Symbolic Garden,* 10–11.

[9] A. Delatte, *Herbarius: Recherches sur le cérémonial usité chez les anciens pour la cueillette des simples et des plantes magiques* (Paris, 1938).

[10] Paris, 1955.

[11] A. Delatte, ed., *Anecdota Atheniensia et alia,* vol. 2, *Textes grecs à l'histoire des sciences* (Paris, 1939).

[12] Thomson, *Textes grecs,* 125–77.

[13] Delatte, *Anecdota,* 273–454.

[14] J. Stannard, "Byzantine Botanical Lexicography," *Episteme* 5 (1971): 168–87.

[15] Delatte, *Anecdota,* 385–92.

[16] Ibid., 339–60.

[17] Thomson, *Textes grecs,* 139–67; Delatte, *Anecdota,* 279–318, 331–39, and 393–417.

fancifully aromatic plants of the symbolic garden: rather these spare listings show repeated attempts at precision in nomenclature, attempts forecast quite early by the multilingual synonyms provided by Dioskorides and later scholiasts,[18] augmented first by an obscure Pamphilus about a century after the original *Materia medica* appeared,[19] and by the "Synonym Lists" of drugs circulating by the second century, illustrated by the Galenic tract under this title.[20]

The Greek tracts published by Delatte and Thomson are ample evidence of an herbalism among the Byzantines, an herbalism rather far removed from the redolently imaginary gardens of pagan and Christian myth. Such treatises also tell us immediately that doctors, pharmacologists, herbalists, *and* farmers not only were very interested (and literate), but also required information about wild as well as cultivated plants: some were used as medicinals, others for the manufacture of ointments and perfumes (especially the numerous "oil plants"), others as food sources on a seasonal basis, still others as condiments, and, of course, as sources of the species transplanted and carefully tended in the well-known gardens of both the Byzantine East and medieval Latin West, with similar and carefully cultivated gardens also characteristic of the Islamic world.[21]

Yet even a short survey of this kind of modern study, representing excellent scholarship and detailed command of the texts and multilingual sources, shows the predominance of an "ideal garden," when a scholar considers medicinal plants or potherbs (e.g., J. Stannard, G. Keil, and C. Opsomer-Halleux in the 1986 *Medieval Gardens*).[22] This tendency is widespread

[18] Most of the presumed synonyms are set below the text of Dioskorides in the Wellmann edition, with the clear designation RV, in turn given parallel readings in other sources by the editor as part of the apparatus criticus.

[19] M. Wellmann, "Pamphilos," *Hermes* 51 (1916): 1–64.

[20] Often cited as "Galen, *Glossary,*" the first set of synonym lists in the Galenic corpus appear in C. G. Kühn, ed., *Claudii Galeni Opera omnia,* 20 vols. (Leipzig, 1821–33; repr. Hildesheim, 1964–65), 19:62–157. The second set of exegetical references and synonyms are in the same volume, 721–47; the first of the pair is devoted to explicating "puzzling" words and definitions of Galen's ideal, Hippocrates; the second tract (if either is genuine: some scholars believe both are Renaissance forgeries) provides a set of "quickie" remedies in a kind of "Substitution List," not synonyms. Apparently whoever compiled this "Substitution List" was well aware that many drugs as listed in the Greco-Roman "Galenic" texts were not available locally from time to time, so such "substitution of drug B for the usual recommendation of drug A" became a model for later Byzantine Greek, classical Arabic, and medieval Latin glossaries of this sort. Unhappily, many scholars have confused Galen's *Glossary* (best read as a series of explications of earlier medical terminologies, including those from the Hippocratic corpus) with the *Substitutions,* so that the novitiate may gain a reference from the *Glossary,* when in actuality it emerges from *Substitutions.* Much of this confusion is nicely laid to rest by R. J. Durling, *A Dictionary of Medical Terms in Galen* (Leiden, 1993), to which an interested scholar should first resort, especially for the sometimes more-than-obscure terms of pharmacology.

[21] Illustrative are the following: A. Watson, *Agricultural Innovation in the Early Islamic World: The Diffusion of Crops and Farming Techniques, 700–1100* (Cambridge, 1983); E. B. MacDougall and R. Ettinghausen, eds., *The Islamic Garden* (Washington, D.C., 1976); D. N. Wilber, *Persian Gardens and Garden Pavilions,* 2d ed. (Washington, D.C., 1979); E. B. MacDougall, ed., *Medieval Gardens* (Washington, D.C., 1986). For Muslim Spain, one of the better studies is L. Bolens, *La cuisine andalouse: Un art de vivre, XIe–XIIIe siècles* (Paris, 1990).

[22] J. Stannard, "Alimentary and Medicinal Use of Plants," in MacDougall, *Medieval Gardens,* 69–92; G. Keil, "Hortus Sanitatis: Gart der Gesundheit. Gaerde der Sunthede," ibid., 55–68; and C. Opsomer-Halleux, "The Medieval Garden and Its Role in Medicine," ibid., 93–114.

in the specialist literature, and particularly characteristic (perhaps appropriately) of the numerous books on medieval English botanical lore, exemplified by the work of Teresa McLean.[23] One can, to be sure, argue that humankind's occupation and cultivation of Europe and the Near East had consumed millennia, and thereby truly feral areas were unusual (unlike the New World in 1492, which was almost *all* wild, with the exceptions of certain Amerindian cultures that flourished and passed away long before the arrival of Europeans), so that "wild" herbs were presumably unimportant in the pharmacal lore of classical antiquity and the Middle Ages.

Our texts, however, demonstrate vividly that physicians in ancient Greece, the Hellenistic world, the Roman Republic, and the successor empires of the Roman and Byzantine centuries, knew and valued *both* wild and cultivated plants, employed as drugs; such are fully attested in the works of many Byzantine physicians and pharmacologists, ranging from Alexander of Tralles to John Aktouarios. In fact, Byzantine concepts of what *was* herbal medicine were fundamental in the teaching of herbal pharmacology in the medical schools of Renaissance Europe; many of these teaching institutions boasted of their own "teaching gardens" that incorporated traditionally cultivated potherbs along with "wild herbs" gathered from local countrysides (with information on the curative powers of these plants also derived from local folklore); soon added to these often beautiful and scrupulously planned teaching gardens were the ever-increasing numbers of "new and wild" botanicals from the New World, Africa, and Asia.[24] And as one would expect, culinary arts overlapped pharmacy in the discussions of plant properties (or "virtues" as they were often termed), so that foods and foodstuffs became part of herbalism in almost all eras.[25] The Byzantines valued such expertise, and some recent scholarship has begun to explore how Portuguese, Spanish, and English, alongside long-term Venetian, trading ventures came to improve the Byzantine diet.[26]

Medical botany is quite prominent in Byzantine medicine, and, as I have indicated elsewhere,[27] early Byzantine pharmacy occupies a central role in how the doctor treats disease, in company with how the physician perceives the "properties" (here usually *dynameis* in the Greek as one explicates how drugs "work"). Our written texts, from Oribasios to Paul of Aegina, repeatedly show how the Byzantine philosopher-physicians (and those sometimes known as iatrosophists) reworked, streamlined, augmented, and clarified the medical and pharmacological texts of the Greco-Roman era. Dioskorides' great *Materia medica* (ca.

[23] *Medieval English Gardens* (London, 1981).

[24] There is an enormous bibliography on the "introduction" of new species into the pharmacal lore of Europe in the Renaissance. For a summary and collection of references, see J. Scarborough, "Botany, Pharmacy, and the Culinary Arts," in A. C. Crombie and N. Siraisi, eds., *The Rational Arts of Living* (Northampton, 1987), 161–204.

[25] This interplay is well demonstrated in two monographs (among many): R. Howard, *La bibliothèque et le laboratoire de Guy de la Brosse au jardin des plantes à Paris* (Geneva, 1983), and W. T. Stern, *Botanical Gardens and Botanical Literature in the Eighteenth Century* (Pittsburgh, 1961).

[26] Most recently (among the welcome interest in "food history" by classicists and medievalists), one may consult with profit A. Dalby, "Biscuits from Byzantium," *Siren Feasts* (London, 1996), 187–211.

[27] J. Scarborough, "Early Byzantine Pharmacology," *DOP* 38 (1984): 213–32.

A.D. 70) had become *the* basic treatise on all aspects of pharmacology and pharmacognosy, and pure botany continued to be represented by Theophrastus' rightly honored *Inquiry into Plants* and *Causes of Plants* (both ca. 300 B.C.). It is, however, Galen of Pergamon (A.D. 129–after 210) who became the absolute authority on all facets of medicine in the Eastern Roman Empire, especially after Oribasios of Pergamon (ca. A.D. 325–400) had performed probably the first known of many attempted truncations, summaries, and rearrangements of Galen's often massive, self-contradictory, and presumably all-inclusive works on medicine (the often-cited edition by C. G. Kühn [Leipzig, 1821–33; repr. Hildesheim, 1963–64] occupies four linear feet on one of my bookshelves).

This overriding authority is further attested by the "Seven Physicians" folio of the A.D. 512 Vienna manuscript of Dioskorides (fol. 3v),[28] which, accompanied by the previous "seven physicians" of folio 2v, provides a pictorial "history of medical authorities" in the early sixth century (notably absent is Hippocrates of Cos). Galen sits top and center on folio 3v, flanked by Dioskorides and Krateuas, the former the major author of this beautiful, alphabetical version of Dioskorides' *Materia medica.* And although one admires the occasionally magnificent (and one growls at some of the paintings, which are dreadful) illuminations of Dioskorides' plants, Nicander of Colophon's poisonous creatures, and some other topics including a manual of ornithology by an otherwise unknown Dionysius, *all* are but

[28] Regarding the famous Vienna codex (properly cited as Codex Vindobonensis med. gr. 1 der Österreichischen Nationalbibliothek), two reproductions of what constitutes 485 folios (weighing 14 lbs.) have appeared in the 20th century: the first was published in Leiden in two volumes by A. W. Sijthoff (1906), with the first volume of descriptive commentary and the second of black and white reproductions of the folios; useful in its day, this *De codicis Dioscuridei Aniciae Iulianae, nunc Vindobonensis Med. Gr. I* (with commentary by A. de Premerstein, C. Wessely, and J. Mantuani), has been completely superseded by the full-color, full-sized reproduction (five volumes, with a sixth containing commentary and listings by H. Gerstinger) published by the Akademische Druck- u. Verlagsanstalt (Graz, 1970). Unlike the 1906 Leiden edition, the 1970 reproduction has full commentary on the other works represented (other than a shortened, alphabetical version of Dioskorides): an anonymus *Poem on the Properties of Herbs* (fols. 388–392); two paraphrases of Nicander's *Theriaka* and *Alexipharmaka* by an otherwise unknown Euteknios (fols. 393–459 [many illuminations scattered here and there in the margins, with many accurate renderings—especially of the blister beetles—and many purely imaginary images of the poisonous creatures retailed by Nicander of Colophon]); a paraphrase of Oppian's *Book on Fishing,* again by Euteknios (fols. 460–473 [the illuminations, however, seem more intended to accompany pseudo-Oppian's lengthy poem, *On Hunting*]); and, finally, a paraphrase of an *Ornithology* (Grk. *Ixeutika*) by an (again) otherwise unknown Dionysios (fols. 474–485 [fol. 483v shows twenty-four birds, quite vividly painted from life]). Most large libraries have copies of the Graz reproduction volumes; I apologize to my readers for my inability to gain permission to reproduce relevant folios from Vienna in time for publication. One can, however, peruse the selection of illuminations, reproduced in full color and size, in O. Mazal, *Pflanzen, Wurzeln, Säfte, Samen: Antike Heilkunst Miniaturen des Wiener Dioskurides* (Graz, 1981), a volume held much more commonly in university libraries. It is interesting to speculate about the first illuminated folio, showing a peacock (male, with feathers spread in the "courting" position), presumably the family's animal (a kind of 6th-century coat of arms), and reflect how this peacock precedes the famous two folios of famous physicians, not to mention the portrait folio 6v, showing the princess Anicia Juliana and her attendants. The tale of how this magnificent manuscript survived to be deposited in the Hapsburg collection in the 16th century is a tale worth telling in itself, perhaps best summarized by G. Sarton, "Brave Busbecq," *Isis* 33 (1942): 557–75. Anicia Juliana was known as a generous benefactor in her day, as suggested by M. Harrison, *A Temple for Byzantium: The Discovery and Excavation of Anicia Juliana's Palace Church in Istanbul* (London, 1989). On this manuscript, see also Leslie Brubaker, "The Vienna Dioskorides and Anicia Juliana," in this volume, 189–214.

selections from the complete works; but those that do appear give us a reasonable guide to which plants were deemed useful in early sixth-century Byzantine pharmacology. It is important likewise that one have in hand the complete, nonalphabetical Greek text of Dioskorides (last and best edited by Max Wellmann in 3 vols. [Berlin, 1906–14; repr. 1958]), so that one can gain a clear impression of which plants were deemed useful in sixth-century Byzantine pharmacology including plants gathered in the wild and those emerging from one of the countless gardens, so appropriately recapitulated and condensed in several books in the tenth-century *Geoponika*. Sometimes what is omitted in the Vienna text of Dioskorides (admittedly our earliest medical manuscript in Greek) is surprising, but inclusion of a plant per se suggests a reader may be presumed to have "known" a more complete account: that the 14-pound codex was not intended as a "field manual" should be apparent, but even as a "royal gift" fit for a princess, the codex is a valuable guide to what plants were thought valuable for a household in the highest levels of the ruling class of the Byzantine Empire in the sixth century.

One example will serve to illustrate the question of "herbs in the field" and "herbs of the garden" as would be depicted in the Vienna manuscript: the opium poppy (*Papaver somniferum* L.).[29] Folio 221v gives a reasonably accurate painting of the opium capsules in the various stages of growth (the leaves are not well depicted, but at least the pinnate edges receive emphasis; the *P. somniferum* does not have multilobed, pinnated leaves as here represented by the unknown artist), and the root stock is somewhat of the "generic" type.

Here is what Dioskorides, 4.64 (ed. Wellmann, 2:218–21; my trans.) has to say about this famous and presumptive analgesic:

> 1. [The opium] poppy. Some is cultivated and grown in gardens, from which the seed is made into bread, and becomes part of a healthy diet; and with honey, they use the poppy seed in place of the sesame seed, and thereby it is called the "common poppy," which has a longish head and a seed that is white. Another kind that is wild has a capsule head that droops, a seed that is black, and is called the "corn poppy," and some term this "rhoias" on account of the juice flowing from it. But there is a third kind of these poppies, much less cultivated, and it is smaller and more useful as a drug; this type has a longish capsule.

Then follow medical and pharmaceutical uses, and Dioskorides makes explicit the variations between the "cultivated" and "wild" poppies (4.64.5 [ed. Wellmann, 2:221; my trans.]):

> Best is the latex (or "juice," = *opos*) which is thick and heavy of the wild kind; it is soporific to the person who smells it, bitter to the taste, easily diluted in water, smooth, white, neither rough nor full of lumps, nor does it congeal as it is passed

[29] For a discussion of both ancient and modern views of opium, see J. Scarborough, "The Opium Poppy in Hellenistic and Roman Medicine," in R. Porter and M. Teich, eds., *Drugs and Narcotics in History* (Cambridge, 1995), 4–23.

> through a sieve as would be characteristic of wax; and set down in the sun and allowed to spread out while melting [identifies it as genuine]; and set alight from an oil lamp, it does not have a darkly colored flame, retaining indeed the odor of its own particular property. Some, however, counterfeit it by mixing the juice of the horned poppy or acacia gum or the juice of the wild lettuce.

This is the text readers and viewers of the famous Vienna codex of the *Materia medica* would have known and consulted; Dioskorides has warned previously (4.3 [ed. Wellmann, 2:119]) that too much of the wild latex can kill, so that the physician-pharmacologist had to use great care in its employment. Several points are important, even in this short account of the opium poppy: some poppies are, indeed, part of garden plots, and would remain so from Roman times through the twentieth century (many botanical gardens today proudly display their specimens of this famous plant, sometimes with a guard closely observing the visitors); those poppies that are cultivated are raised for their oilseeds, and they remain a staple in the production of breads (the ancients were well aware that there are no narcotic properties in the seeds); and, as Dioskorides and the Vienna version make clear enough, it is the *wild* variety that is gathered for the ill-famed soporific and occasionally for its death-dealing properties. These uses were well known to Nicander of Colophon (fl. ca. 130 B.C.) and his sources,[30] so that wild and cultivated poppies are part of the long history of classical and Byzantine gardening culture, as well as the lore of gathering the latex from the maturing plant in the field.

It is unlikely that the artist who rendered the opium poppy on folio 221v of the Vienna codex has painted from life, but he *has* captured the four basic stages of the life cycle of the capsules' development (harvesting the best latex is detailed in Dioskorides, 4.64.7 [ed. Wellmann, 2:221]), and except for some slightly more sophisticated knives and collection pans, the methods of modern harvesting of the *P. somniferum*'s latex from the capsules *just before they ripen* (almost exactly what Dioskorides records) remain almost identical. Moreover, ancient pharmacologists and their Byzantine successors were well aware that there were several varieties of poppies, ranging from a truly "wild" kind (Vienna codex, fol. 222) through less potent varieties (fols. 223v, 224v, and 225v). The scholia on poppies in the text of Dioskorides are not particularly revealing of Byzantine gardeners' or physicians' experiences that might have varied from the textual tradition, so that it would seem that later doctors and pharmacologists found that Dioskorides was essentially correct. That same textual tradition, beginning in the second century, suggested that repeated employment of the opium poppy latex thus generally verified the account of Dioskorides, confirmed as one examines parallel passages, condensed by Oribasios, or elaborated by Alexander of Tralles, and a few others, conveniently listed in Wellmann's apparatus criticus.

Yet the Byzantine scribes did not simply parrot their classical texts in medicine and related matters, and one can choose no better example than that selected by John Riddle, in

[30] Scarborough, "Opium Poppy," 11.

his fine essay of 1984,[31] to illustrate two matters: (1) additional information by later and obviously experienced gardeners and physicians; and (2) parallel traditions accompanying the texts of the *Materia medica,* in this instance an almost exact match with a series of passages in the *Geoponika*. When Riddle submitted his essay for inclusion in the published collection of papers resulting from the 1983 Dumbarton Oaks Symposium on Byzantine Medicine, I was happy to augment his arguments on asparagus with the *Geoponika,* and I think it quite appropriate here to call attention to these again.

Dioskorides, 2.125 (ed. Wellmann, 1:198; my trans.), had written that "some" (in his usual manner of giving a report that he has heard but did not necessarily believe) "have set down that if someone were to bury rams' horns broken into small pieces, asparagus grows." A scribe, sometime before the fourteenth century, flatly denied this, saying in his scholiastic comment, "this appears incredible to me," and, as Riddle notes, this *emoi de apithanon* appears in at least ten variant manuscripts of Dioskorides' discussion of this common garden vegetable. And although Riddle did not make particular note of Dioskorides' account of the utility of the asparagus, it is clear (again) that both wild and garden-grown varieties are included: the feral sort grows in rocky soils, the cultivar as one would expect in the soils prepared for other vegetables (medicinal uses are those well known in many folk traditions: bowel softener, diuretic, treatment for sciatica and jaundice, as a remedy for toothache, and as an antidote for the bites of poisonous spiders). Perhaps the gardener is attempting to duplicate the "rocky" soil for his asparagus plot (a tricky and long-term vegetable to grow as any modern gardener all too well knows), but of importance is the parallel passage in the tenth-century *Geoponika* (last edited by H. Beckh as *Geoponica sive Cassiani Bassi scholastici De re rustica eclogae* [Leipzig, 1895; repr. Stuttgart, 1994]),[32] which reads: "If one wishes to produce an abundance of asparagus, chop up horns of the wild ram into small pieces, throw them into the asparagus beds, and water them. Some [others] say that it is better if the whole rams' horns are bored with holes and then put down into the soil, they will produce asparagus" (*Geoponika,* 12.18.2–3 [ed. Beckh, p. 365; my trans.]).

Quite puzzling in this passage is its description of technical details: is the would-be gardener being advised to put rootstocks (or crowns) of old asparagus into the holed rams' horns? Growing edible asparagus from seeds gives poor yield, but crown-growth from permanent beds can yield annually (after the third year); the tender shoots of springtime (in temperate climes) can be harvested repeatedly for up to twenty years. One is, however, struck by the *Geoponika* extract that both a "wild" and a "cultivated" sort are known and used. The extract (if we can rely on the copyists of the tenth century) is quoted from a Didymus, probably the Didymus of Alexandria known to have written a fifteen-book *Georgika* in the fifth century, and if Wellmann is right,[33] Didymus was a physician of some repute. The mix of agricultural and pharmacological data remains explicit, and the passage in Dioskorides neatly interlocks with that of Didymus as quoted in the tenth-century *Geoponika*.

[31] J. M. Riddle, "Byzantine Commentaries on Dioscorides," *DOP* 38 (1984): 95–102.

[32] On this text, see also Robert Rodgers, "Κηποποιΐα: Garden Making and Garden Culture in the *Geoponika*," in this volume.

[33] M. Wellmann, "Didymus," *RE,* vol. 9 (Stuttgart, 1903), 445.

The Byzantine text is incorporated into the book "on" gardens (e.g., 12.2 [ed. Beckh, pp. 349–50]), quoted from an otherwise unknown Florentinus, and headed "How to make a garden," with a preceding "gardening calendar" (12.1.1–2 [ed. Beckh, pp. 347–49]): January through December, with each month specified with plantings "as is suitable for the climate of Constantinople." As one reads through the accounts of the particular vegetables and foodstuffs (asparagus, lettuce, beets, cabbages, and so on), one notes again and again that there are "wild kinds" also to be harvested, and one again can use the exemplar of the asparagus: *Geoponika* 12.18.4 and 5 (ed. Beckh, p. 365) tells us that in order to have asparagus year-round, one is to take the seeds [?: such are really more akin to "berries"] and weed around the surface roots, a description that can match only what one finds in the growth patterns of the still common "wild asparagus" of Turkey; its underground stem grows horizontally, which then produces the spring shoots that are very tender and tasty, the so-called turions. Gathering asparagus, for both medical and culinary purposes, thus includes garden lore as well as a common knowledge of how this vegetable favors sandy soils. Modern California's January "asparagus spears," so horribly expensive in a Wisconsin winter, are, in some respects, quite like those gained by herbalists in fifth-century Alexandria and tenth-century Constantinople. And these were gathered and marketed by professional "herbalists," not gardeners of the town. These "herbalists" were indeed "farmers" addressed and assumed to be literate, an assumption by the compilers of the text we have as the *Geoponika*. This manner of mixing the cultivars with the gathering of "wild" species, for the sake of (one presumes) freshness, could be illustrated by several accounts in *Geoponika* 12 and in other books of the same compilation that address plants and their employment as drugs, foods, or condiments.

My last example of the continual intermeshing of farm and field with the geometrically pleasing "ideal gardens," so common in medieval times from England to Bombay, had more to do with veterinary practices than with vegetables, but will illustrate the same point: knowledge flowing both ways, from city to countryside and back again, perhaps "corrected" or "refined" for the city slickers. We have to keep in mind that most people lived in the country in those days, with a few making a living knowing the plants to be gathered, while the great majority tilled the fields of one or another overlord, living out their years as had their forefathers before them. Life in the country, however, was not without its special realms of pure knowledge. Country dwellers (*pagani* in Latin) "knew" the plants: they did not "name" them, a habit that reaches back as far as Mycenaean times and Homeric Greece, if not to the beginnings of our species somewhere in northeastern Africa some many millennia ago.

Alongside the domestication of wheat, rice, barley, oats, and several other food plants came the domestication of animals. We do not know "when" these processes were firmly in place, but with the creation of urban centers in Mesopotamia, China, India, Egypt, and elsewhere after about 7000 B.C., we find animals side by side with the plants on the farms (by whatever name) most of the human population tilled. From the very beginnings, people and animals transferred illnesses to one another, but, except for the worst of the plagues, it would seem that most of what today we would call illnesses went unnoticed, as a part of

normal life. Even so, as we learn in the late texts we know as the *Geoponika* and the collection of excerpts from the same era which we call the *Corpus hippiatricorum Graecorum,*[34] farmers and horsemen had many problems with parasites on and in their animals, and I have chosen one very intriguing passage in the *Geoponika* that indicates Byzantine sheep herders *did* deal with ticks and other irritating pests. Indeed, the modern world is coming back to something like these natural insecticides or vermicides, since there would be, by definition, very few (if any) "side effects" or long-term damage to either the environment or to the productive capability of the sheep and their prized wool. *Geoponika* 17.16 is headed "Concerning lice. From Didymus," and one reads (ed. Beckh, p. 495; my trans.):

> 1. If sheep have ticks or lice, pound thoroughly some maple tree roots and boil this mash in water; part the wool on the sheep from head to the end of the spinal column, and then pour this liquid on while still warm, so that it finds its way over the whole animal's body. Some use cedar oil in the same way.
> 2. Some others likewise in a similar fashion prepare mandrake root for this use, but one must ensure that the animals do not ingest this mandrake root wash, since it is poisonous to them.
> 3. Others prepare likewise in a similar fashion a decoction of cyperus root and wash the sheep with it.[35]

From the modern vantage, the phytochemistry and the "logic" of using a maple root wash and its tannin as an excellent flea- and tick-repellent, makes good sense, but the cyperus root's chemical properties remain obscure. At this juncture, however, I wish to emphasize the curious appearance of mandrake as a "delouser" for sheep.

Mandrake (*Mandragora officinarum* L. or *M. autumnalis* Spr.), among the six species known in ancient and modern times, contains goodly amounts of hyoscyamine, a powerful narcotic, especially in the famous "manlike" roots. The narcotic properties of the mandrake were famous among laypersons and professional medical practitioners, and its fame reached even into a well-known scene in Apuleius' *Golden Ass,*[36] where the physician and those listening to his testimony *both* knew of the generally safe anesthetic properties of mandrake. Mandrake leads us immediately back to the Vienna codex of Dioskorides: widely known is folio 5v, depicting three figures doing three things with the mandrake root (and *this* painting of the root [twice] is not replicated elsewhere in the codex); on the right is Dioskorides reading the account of the plant and its properties (4.75 [ed. Wellmann, 2:233–37]); in the center Epinoia holds the root in her hands extended in front of her to ensure that the

[34] E. Oder and C. Hoppe, eds., *Corpus hippiatricorum Graecorum,* 2 vols. (Leipzig, 1924–27; repr. Stuttgart, 1971). Most recently, a third compilation of this sort from the mid-10th century on toxicology has been documented by Sibylle Ihm, ed., *Der Traktat Peri tōn iobolōn thēriōn kai dēlētēriōn pharmakōn des sog. Aelius Promotus* (Wiesbaden, 1995).

[35] I suspect that *kypeiros* is not galingale, but either the edible cyperus (*Cyperus esculentus* L.), or perhaps a turmeric (*Curcuma longa* L.), known as early as Dioskorides, whose *Materia medica,* 1.5, seems to be the first mention of this Indian rhizome, today used as a condiment in curries.

[36] Apuleius, *Golden Ass* (or *Metamorphoses*), 10.11.

viewer sees exactly its color and shape; and on the left of the full-page folio is the artist depicting the plant while he looks at Epinoia, not Dioskorides. Mandrake is, in effect, the first medicinal plant in the codex, and Dioskorides' full description of the properties and uses of mandrake root parallels its employment today in many folk medical systems from Spain to India: it is an excellent purgative and emetic, with narcotic properties particularly valuable in treatment for asthma, hay fever, and coughs, since the alkaloidal phytochemistry in the "natural" drug acts as vasodilators. There are numerous references in the medical sources of classical antiquity, as well as those of the Byzantine era: mandrake was the narcotic of choice, or, as Dioskorides puts it, "The physicians use this whenever they are about to begin cutting [i.e., surgery], or when they are cauterizing [a wound] shut" (4.75.7 [ed. Wellmann, 2:237; my trans.]).

Garden plant or wild? Evidence shows (again) both. In the text "On the Mandrake," printed by Thomson in her *Textes grecs inédits* (pp. 84–87; numbered texts 5, 3, and 4), it is clear that this is indeed an herb raised and used against leprosy and eye diseases and as a remedy for raging diarrhea, among other afflictions. Older traditions (e.g., Theophrastus, *Historia plantarum,* 9.9.1 and Dioskorides as above) indicate that mandrake was brought into market by ever-present and expert *rhizotomoi* ("root cutters").

Throughout the centuries, there is little doubt that anyone could obtain mandrake in just about any season, as would be true of the opium poppy and its hardened latex, easily remelted as needed. Among the Byzantines, one gains the sure impression from Alexander of Tralles' directions for the preparation of pastilles for specific treatment of quartan fevers characterized by yellow bile,[37] that *all* ingredients are commonly obtained and that many are "garden cultivated": one reads about the saffron crocus, licorice, anise, castor (a plant in this instance), henbane (if this, indeed, is what *hyoskyamos leukos* means), and likely enough the three grams of mandrake "bark" (the outer layers of the root) that end the preparation formula. Alexander of Tralles is recording what he considered "tried and true" pharmaceutical recipes sometime at the very end of the sixth century or, at the very latest, the beginning years of the seventh. A principle of his practice and its written summary is almost always a direct simplicity, a characteristic especially true of his botanical or medicinal pharmacy. The opium poppy is an "ordinary" drug, much as is mandrake (whether its "apples" or juice or rind or stem or roots). Alexander's long career and extensive travels (he died in Rome in A.D. 605) enabled him to compose several medical masterpieces, including the *Book on Fevers,* the *Twelve Books on Medicine,* and the *Letter on Intestinal Worms* (this last tract is the first western treatise on parasitology and deserves careful translation and commentary). He has carefully selected drugs readily obtained from feral areas and then brought to the marketplace, or, as one would expect, from the common herb gardens; such cultivated plots included well-known poisons like aconite, the two hellebores, henbane, and the ever-infamous hemlock, not to mention the commonly employed female contraceptives, pennyroyal and rue. In both pharmacy and cooking, in the manufacture of perfumes or the flavorings of

[37] Alexander of Tralles, *Book on Fevers,* 7 (ed. T. Puschmann, *Alexander von Tralles,* 2 vols. [Vienna, 1878–79; repr. Amsterdam, 1963], 1:426–29, especially formulas and measures, 429).

wine, "fresh" was a mark of quality, so that "out of season" would engender the ordinary assumption of the continual activity of farmers and the *rhizotomoi* (who were in all likelihood farmers too) who gathered herbs for the market stalls, so nicely recorded by Pollux in the second century.[38]

In summary, even a short study reveals food and medicinal sources in the Byzantine Empire rather well balanced by city and countryside. Wheat, barley, and other long-cultivated staples continued to be planted and harvested by the traditional farmer, and his stock (whether pigs, chickens, and so on) contributed the major part of each Byzantine city's food supply. Herb gardens existed almost in all cities in great numbers, but much of what we know of Byzantine drugs, condiments, perfume production, and several other "luxury" products (e.g., wine flavorings), and the frequently ignored production of the best grapes for the finest wines, remained (obviously) products of the country dwellers. In medicinal pharmacy, Byzantine root gatherers and farmers at large provided specific herbs, especially "out of season," suggested by the examples of asparagus, the opium poppy, and mandrake.

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[38] Pollux, *Onomasticon,* 5.132 (ed. E. Bethe, *Pollucis Onomasticon,* 3 vols. [Leipzig, 1900–1937; repr. Stuttgart, 1967], 1:297).

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EARLY BYZANTINE PHARMACOLOGY

JOHN SCARBOROUGH

INTRODUCTION

The study of Byzantine drug lore presents the modern scholar with several problems. At first glance, it would appear that Oribasius, Aetius of Amida, Alexander of Tralles, and Paul of Aegina have simply replicated data and nomenclature found in the works of Dioscorides, Galen, and other earlier Greek and Roman accounts of herbs and herbals, medicinal minerals, and animal products employed in the manufacture of drugs. Yet when one investigates carefully the Greek texts of all four of these major so-called compilers in the history of early Byzantine medicine, one soon discovers that there are indeed duplications from Greco-Roman authorities in consideration of drugs and drug lore, but that the theory of drug-action has shifted in an important manner, and also that substances used in pharmacy have been augmented, both in number and in kind. This new theory of pharmacology, based firmly upon scattered statements from a wide range of Galenic writings, can be nicely illustrated with the lengthy prologue by Aetius of Amida to his *Medical Books* (the *Tetrabiblon*).[1] Moreover, when one compares "borrowing" by Oribasius, Aetius, Alexander, and Paul, from Galen and earlier authorities, one discerns significant variations in syntax and, most importantly, a clear consideration of medicinal substances in their own right, rather far removed from the copyist epithet often given to these early Byzantine medical writers. Oribasius and Alexander, in particular, submit drug recipes that show a command of the ancient texts and personal experience with pharmaceuticals.

We are also fortunate in being able to link the allegedly formal aspects of early Byzantine drug lore with data that the non-physician might know—at least in late Roman and Byzantine Egypt. Many papyri, especially those contained in the collection called the *Papyri Graeci Magicae*,[2] show how drugs and pharmaceuticals were used in numerous non-medical contexts, but of great importance among these papyrological citations is the assumption of common knowledge of the *kyphi* and *krisma* recipes, also significant in the formal works by Byzantine physicians on pharmacology. Early Byzantine pharmacy drew upon classical heritages—from the Hippocratics through Galen—but it also shows a clear development of its own, seen best in a reworked drug theory and in the augmentation of particular substances employed as pharmaceuticals. This sophisticated pharmacy is also paralleled in the papyri,[3] but these documents are, of course, shorn of theory, which may or may not have penetrated into the ranks of Egyptian priests, soothsayers, and purported experts in magic.[4]

THE HISTORICAL BACKGROUND OF GREEK AND ROMAN PHARMACY TO GALEN

Drug lore is the first aspect of Greek medicine that can be documented, since spices and presumed pharmaceuticals turn up in the Linear B tablets of Mycenaean Greece and Crete.[5] After the

[The reader is referred to the list of abbreviations at the end of the volume.]

[1] Aetius I *prooemium* (ed. Olivieri [*CMG* VIII 1], pp. 17–30).

[2] See esp. *PGM*, IV, 2307–9; XII, 401–45; XXXVI, 322–32.

[3] Marie-Hélène Marganne, *Inventaire analytique des papyrus grecs de médecine* (Geneva, 1981). Magical papyri are excluded.

[4] E.g., *PGM*, XII, 401–45. Cf. H. Harrauer and P. J. Sijpestein, *Medizinische Rezepte und Verwandtes* (Vienna, 1981); K. Sudhoff, *Ärztliches aus griechischen Papyrus-Urkunden* (Leipzig, 1909); H. I. Bell, A. D. Nock, and H. Thompson, *Magical Texts from a Bilingual Papyrus in the British Museum* (London, 1931 [Proceedings of the British Academy, Vol. XVII]). Unfortunately, the rich lore and medical equivalencies in E. A. E. Reymond, *From the Contents of the Libraries of the Suchos Temples in the Fayyum*, Part I: *A Medical Book from Crocodilopolis P. Vindob. D. 6257* (Vienna, 1976), cannot be trusted. A new edition with translation and commentary of P. Vindobonensis D. 6257 is in preparation at the Oriental Institute of the University of Chicago.

[5] See esp. L. R. Palmer, *Interpretation of Mycenaean Greek Texts* (Oxford, 1963), Nos. 163–168 [pp. 269–73], and J. Chadwick, *Documents in Mycenaean Greek*, 2nd ed. (Cambridge, 1973), Nos.

passing of the Mycenaeans, there is good indication of a common knowledge of *pharmaka* (at least those that were involved in application of simples for minor wounds, and those that were deemed potent in spells and incantations) in Homer's epics,[6] so that drug lore probably flourished among the Greeks of the Homeric Age, much as it would later.[7] Lyric poetry has left us with some isolated mentions of drugs and salves,[8] and there is firm evidence that certain drugs were well known among the Greeks in the fifth century B.C., suggested by puns in Aristophanes and other non-medical writers.[9] It is not until the fifth and fourth centuries B.C. that a separate study of medical plants was made a part of formal medical practice, and the Pseudo-Aristotelian *Problems* probably mirror the same sources for drugs and drug theory that appear also in several books of the Hippocratic *corpus*.[10] Diocles of Carystos (a contemporary of Aristotle)[11] studied plants for their pharmaceutical properties, and the study of botany received a canonical form in Theophrastus' *Historia plantarum* and *De causis plantarum* (both c. 300 B.C.);[12] Book IX of *Historia plantarum* is our first extant herbal in Greek.[13] Theophrastus carefully classifies plants by their leaves, roots, seeds, stems, and growing season, and the methodologies of his master, Aristotle, show brilliantly in the taxonomy and morphology.[14]

Although there is good evidence for the study of pharmacy in the Hellenistic era, our available texts for the period consist of fragmentary remains of the drug lore of Apollodorus (*fl.* c. 250 B.C.),[15] and such notables as Herophilus and Erasistratus (both *fl.* 270–260 B.C.),[16] as well as the two poems on toxicology by Nicander of Colophon (*fl.* c. 130 B.C.) called *Theriaca* and *Alexipharmaca*.[17] Nicander stole his data from the lost works of Apollodorus, who had made a detailed study of toxic substances, poisonous snakes, scorpions, spiders, and insects,[18] apparently in the manner of Peripatetic natural history,[19] but it would be Nicander's obtuse poems that became standard "textbooks" in toxicology, employed by almost all medical authorities from his own time through the European Renaissance.[20]

Theophrastus struggled with the problem of how drugs were to be classified, and he provides an extremely muddled system in *Historia plantarum* IX.[21] Much of his data is derived from a professional class of *rhizotomoi*, whose firsthand experience Theophrastus records in several instances.[22] Yet the definition of *poa* ("herb") remains hopelessly vague, since Theophrastus' overriding methodology demanded first attention to morphology and taxonomy, not to the medical properties of any particular plant or drug made from a plant. A foggy notion

103, 105, and 107 [pp. 224, 228, and 231]. A few, scattered studies have begun to appear on these texts and similar ones, e.g., Anna Sacconi, "La mirra nella preparazione degli unguenti profumati a Cnosso," *Athenaeum*, n.s. 47 (1969), 281–89; C. P. W. Warren, "Some Aspects of Medicine in the Greek Bronze Age," *Medical History*, 14 (1970), 364–77; and R. Janko, "Un 1314: Herbal Remedies at Pylos," *Minos*, 17 (1981), 30–34.

[6] E.g., Homer, *Odyssey* X, 304–6, 316–17, and 391–94, among many references.

[7] Cf. Homer, *Iliad* VIII, 306–8, with Dioscorides IV, 64.1 (ed. Wellmann, II, p. 218).

[8] When Sappho, Frg. 96 (var. eds., trans. D. A. Campbell, *Greek Lyric*, I [Cambridge, Mass., 1982], p. 120 [Loeb]), writes "the dew is shed in beauty, and roses bloom and tender chervil and flowery melilot," one immediately perceives a long-lived close acquaintance with herbs and flowers. Sappho, Frgs. 105, 143, 189, and 210 (Campbell, pp. 132, 156, 180 and 192) mention hyacinth, chick peas, nitrum, and fustic. Cf. Theognis 537 and 1193 (squill and spiny broom); Simonides 10 (myrtle); Hesiod, *Works* 41 (asphodel), etc., among many references.

[9] E.g., Aristophanes, *Lysistrata* 89, and *Peace* 712 (puns on the uses of the pennyroyal [*Mentha pulegium* L.]). Discussion in Scarborough, "Nicander II," 74–75 with nn. 239–54.

[10] J. Scarborough, "Theoretical Assumptions in Hippocratic Pharmacology," in F. Lasserre and P. Mudry, eds., *Formes de pensée dans la collection hippocratique: Actes du IV^e Colloque international hippocratique (Lausanne . . . 1981)* (Geneva, 1983), 307–25.

[11] W. Jaeger, *Diokles von Karystos*, 2nd ed. (Berlin, 1963), 186–236. The fairly extensive fragments of Diocles' writings are collected in M. Wellmann, ed., *Die Fragmente der sikelischen Ärzte Akron, Philistion und des Diokles von Karystos* (Berlin, 1901), 117–207.

[12] F. Egerton, ed., *Edward Lee Greene: Landmarks of Botanical History* (Stanford, California, 1983; 2 vols.), I, 128–211.

[13] J. Scarborough, "Theophrastus on Herbals and Herbal Remedies," *JHB*, 11 (1978), 353–85.

[14] Egerton, ed., *Greene* (n. 12 above), I, 169–89. O. Regenbogen, "Theophrastos," *RE*, Supplementband VII (Stuttgart, 1940), cols. 1354–1562, esp. 1435–79 (botany).

[15] M. Wellmann, "Apollodorus (69)," *RE*, Vol. I, part 2 (Stuttgart, 1894), col. 2895, and (same author), "Das älteste Kräuterbuch der Griechen," in *Festgabe für Franz Susemihl* (Leipzig, 1898), 1–31. J. Scarborough, "Nicander's Toxicology, I: Snakes," *PH*, 19 (1977), 3–23 (3–4, with nn. 8–19).

[16] P. M. Fraser, *Ptolemaic Alexandria* (Oxford, 1972; 3 vols.), I, 353, and II, 519 n. 116, and 627 n. 472 [Herophilus]. R. Fuchs, "Eine neue Receptformel des Erasistratos," *Hermes*, 33 (1898), 342–44.

[17] Nicander (ed. and trans. Gow and Scholfield) is the best edition available, with a translation quite often based on shrewd guesswork—openly admitted by the editors.

[18] Scarborough, "Nicander's Snakes" (n. 15 above), 3–4, and (same author), "Nicander II" *passim*.

[19] Scarborough, "Nicander II," 5–6. Wellmann, "Kräuterbuch" (n. 15 above), 28.

[20] E.g., a late Greek manuscript (Bologna, Bibl. Univ. Codex 3632, esp. fol. 417) of the late fifteenth or early sixteenth century. Scarborough, "Nicander II," 4, with nn. 4–8.

[21] Egerton, ed., *Greene* (n. 12 above), I, 180–81. Scarborough, "Theophrastus" (n. 13 above), 356–57.

[22] Theophrastus, *HP* IX, 8 *passim*; 11.7 and 9; 15.2; 16.3; 18.3 and 10; and 20.4.

of toxicology does appear in Book IX of *Historia plantarum*,[23] but Theophrastus and his sources seem unaware of a basic theory that would explain the differences among drugs. Some hints of an embryonic theory of toxicology do, indeed, appear in the Pseudo-Aristotelian *Problems*, as well as certain tracts of the Hippocratic *corpus*, but there is more of an attempt to collect data than to propose a logical and careful hypothesis about how and why drugs "work" as they do. Nicander's poems also reflect this attention to the collection of details, and the lack of a cohesive theory to link them together, and the fragments of other Hellenistic pharmacologists likewise suggest a haphazard and often erroneous set of prescriptions, or—in the cases of Herophilus and Erasistratus—an attempt to set down specific treatments for particular ailments, in the classic manner of the Hippocratic writers.

Dioscorides of Anazarbus (*fl.* c. A.D. 65) attempted to change the chaos of pharmacology into an ordered system.[24] He seems to have invented a "drug affinity" methodology for the study of pharmaceuticals, quite similar to the modern concepts underlying pharmacognosy, but this non-alphabetical, non-humoral theory demanded precise observation of plants in their varying growing seasons as well as extreme accuracy in the physician's observations concerning which drugs were useful against which specific ailments and diseases. Dioscorides' *Materia medica* certainly became a classic handbook, quoted by almost all later writers on pharmacy (both Greek and Latin, as well as Arabic) for nearly 1800 years.[25] He includes nearly 600 species of plants in the *Materia medica*,[26] compared with approximately 450 species in the Hippocratic *corpus*,[27] the 550 species recorded by Theophrastus,[28] and the 300 plant names given by Nicander.[29] Dioscorides' listings encompass many drugs introduced into Greco-Roman pharmacy from the Far East,[30] showing the expansion of trade and geographic knowledge in the Hellenistic era and in the first decades of Roman imperial rule in the eastern Mediterranean.[31] His rejection, however, of both the poetic form of relating knowledge of drugs (illustrated by the difficult hexameters of Nicander) and also the apparently standard manner of listing simples in alphabetical order,[32] led in turn to the discarding of Dioscorides' classification system by later pharmacologists, including the chalcenteric Galen.[33] Dioscorides' drug lore tapped not only the formal sources of pharmacology, as they might be found in earlier written records, but also folk medicine, acknowledged from time to time in the *Materia medica*.[34] Moreover, he insists that the would-be pharmacologist has to know his plants, not from book-learning, but by patient and lengthy observation of herb growth as they changed form, shape, and color through differing seasons in various geographic locations as he knew them generally in the eastern Mediterranean litoral.[35] Added to the demand of painstaking observation of reaction to drugs by actual patients, these two requirements by Dioscorides soon led to modifications, including a return to alphabetical listings and pharmaceutical poetry.[36] While respecting Dioscorides for his obvious learning and meticulous attention to botanical details, Galen rejected the "drug affinity" system, while retaining (at least he says he does) Dioscorides' admonition to know the plants from personal experience. And it would be Galen, not Dioscorides, who would provide the beginning models for Byzantine drug lore.

Galen's Pharmacy

Galen of Pergamon (A.D. 129-prob. 210) looms as one of the most influential writers in the entire history of medicine.[37] His summary of all aspects

[23] Theophrastus, *HP* IX, 16.4–7. Scarborough, "Theophrastus" (n. 13 above), 376–77 with nn. 131–35.

[24] Scarborough and Nutton, "Preface," 189–90. J. M. Riddle, "Dioscorides," *DSB*, Vol. IV (New York, 1971), 119–23. Riddle's *Dioscorides* (Austin, Texas [in press]) explicates in brilliant detail Dioscorides' "drug affinity" system.

[25] J. M. Riddle, "Dioscorides" in *Catalogus* IV, 1–143. Scarborough and Nutton, "Preface," 187–88.

[26] J. Stannard, "Byzantine Botanical Lexicography," *Episteme*, 5 (1971), 168–87 [171].

[27] My "count" differs sharply with that of Stannard (*ibid.*), who suggests about 225 spp. [p. 170].

[28] Regenbogen, "Theophrastos" (n. 14 above), col. 1467. Egerton, ed., *Greene* (n. 12 above), I, 96 gives 500 as his "count."

[29] Based on Nicander, ed. and trans. Gow and Scholfield.

[30] E.g., ginger (*Zingiber officinale* Roscoe) among several. J. I. Miller, *The Spice Trade of the Roman Empire* (Oxford, 1969), 53–57.

[31] J. Scarborough, "Roman Pharmacy and the Eastern Drug Trade," *PH*, 24 (1982), 135–43.

[32] Scarborough and Nutton, "Preface," 212–13.

[33] *Ibid.*, 190–91.

[34] *Ibid.*, 189 with nn. 10 and 13.

[35] Dioscorides, *Preface* 7 (ed. Wellmann, I, p. 4; trans. Scarborough and Nutton, "Preface," 196–97).

[36] E.g. the medical poetry of Damocrates (quoted by Galen) and most of the drug lists by Galen.

[37] The literature on Galen is enormous, but only a few works are based securely on the Greek texts. Recommended are: V. Nutton, "The Chronology of Galen's Early Career," *CQ*, n.s. 23 (1973), 158–71, and [same author], "Galen and Medical Auto-

of medicine and related matters, including philosophy and pharmacology, exerted a heavy sway over physicians and medical commentators well into the nineteenth century,[38] and one may gauge his prolixity and learning by the simple task of counting the volumes (20) represented by the Kühn edition of Galen.[39] Since his drug lore influenced later writers, especially in the Byzantine East, so heavily, one necessarily must consider Galen's pharmacology in some detail in order to perceive how early Byzantine drug theory might be similar to and different from the presumed blueprints laid down in several of his treatises which consider pharmaceuticals in particular.

Galen's drug lore is scattered throughout the massive number of works left under his name, but much of his approach to pharmacology, herbs, and treatments through pharmaceuticals is concentrated in *Mixtures and Properties of Simples*,[40] *Compound Drugs Arranged by Location of Ailment*,[41] *Compound Drugs Arranged by Kind*,[42] *Antidotes*,[43] and similar tracts, some of which may be spurious.[44] Galen quotes from dozens of earlier Greek and Roman pharmacologists—including Dioscorides—and although Galen insists one had to know plants and drugs personally,[45] many of the recipes, prescriptions, and treatments are filched from earlier authorities,[46] most often through previous collections of recipes compiled by Andromachus (physician to Nero [A.D. 54–68]), Asclepiades the Pharmacist (prob. *fl.* c. A.D. 50), and Criton (physician to Trajan [A.D. 98–117]). He includes all of the famous simples, known from the time of Theophrastus, but adds no new herbs to the varieties already known to Dioscorides.

In *Mixtures and Properties of Simples* I–V,[47] Galen sets out in an incredibly verbose fashion his composite theory of drug action, based upon degree of cold and hot, moist and dry, with subtle subclassifications generally measured according to the senses of taste, touch, and smell. Not surprisingly, these 329 Kühn pages will not form the foundation of Byzantine adaptation of Galen's drug theories, as will be suggested below with the consideration of the Preface to Aetius' *Medical Books*. Galen proposes his arguments upon what he says are the "best authorities," and *Simples* I–V is replete with name-dropping of the worthies of the pharmaceutical past, from Diocles, Hippocrates, and Theophrastus, through Dioscorides and Asclepiades. What emerges in this involuted summary is the famous "drugs by degrees" system,[48] which would retain its hold on western pharmacy until the nineteenth century. Only in the beginning of Book VI of *Simples* does Galen speak in specific about drugs, and then only after a Preface to Book VI in which he warns against misleading authorities (for example, Pamphilus)[49] who were not experts in plants, and in which he re-lists the reliable sources (a long list that includes Dioscorides)[50]—but Galen lets us know that none of his predecessors understood drugs as well as he does. Then follows the listing of drugs, beginning with "On Shrubby Wormwood and Absinthe and their Particular Kinds."[51] Unlike the extreme clarity of Dioscorides, we read a muddled catalogue of properties generally based on locale. *Simples* VI, 2[52] is "On Agnus Castus," *Simples* VI, 3 is "On Dog's Tooth Grass" [*agrōstis*],[53] VI, 4 is "The Four Kinds of Alkanet" [*anchousa*],[54] VI, 5 is "The Agaric 'Root'"

biography," *Proceedings of the Cambridge Philological Society*, 18 (1972), 50–62; J. Scarborough, "The Galenic Question," *SA*, 65 (1981), 1–31, and (same author), "Galen and the Gladiators," *Episteme*, 5 (1971), 98–111; J. Ilberg, "Aus Galens Praxis," *Neue Jahrbücher für das klassische Altertum*, 15 (1905), 276–312 (rptd. in H. Flashar, ed., *Antike Medizin* [Darmstadt, 1971], 361–416); J. Mewaldt, "Galenos (2)," *RE*, Vol. VII, part 1 (Stuttgart, 1910), cols. 578–91; F. Kudlien and L. G. Wilson, "Galen," *DSB*, Vol. V (New York, 1972), 227–37; W. D. Smith, *The Hippocratic Tradition* (Ithaca, New York, 1979), 61–176; J. Kollesch, "Galen und die Zweite Sophistik," in Nutton, ed., *Galen: Problems*, 1–12; and—above all—Temkin, *Galenism*, 10–50 ("The Portrait of an Ideal").

[38] Temkin, *Galenism*, 134–92 ("Fall and Afterlife").

[39] The texts of Galen in *CMG* are a small proportion of the works contained in the Kühn ed., which is badly marred by corruptions. To the listing in H. Leitner, *Bibliography to the Ancient Medical Authors* (Bern, 1973), 38–39, can now be added: Nutton, ed., *Galen On Prognosis*; and De Lacy, ed., *Galen On the Doctrines of Hippocrates and Plato*.

[40] Ed. Kühn, XI, 379–892, and XII, 1–377 (in 11 books).

[41] Ed. Kühn, XII, 378–1007, and XIII, 1–361 (in 10 books).

[42] Ed. Kühn, XIII, 362–1058 (in 7 books).

[43] Ed. Kühn, XIV, 1–209 (in 2 books)

[44] *Theriac to Piso* (ed. Kühn, XIV, 210–94 [possible]), *Theriac to Pamphilus* (ed. Kühn, XIV, 295–310 [certainly spurious]), *Easily-Obtained Drugs* (ed. Kühn, XIV, 311–581 in 3 books [certainly spurious]).

[45] Galen, *Mixtures and Properties of Simples* VI, preface (ed. Kühn, XI, 797). Scarborough, *Medicine*, 128–30.

[46] Fabricius, 62–100.

[47] Ed. Kühn, XI, 459–788.

[48] See discussion of Aetius with nn. 149–68 below.

[49] Ed. Kühn, XI, 793–94.

[50] *Ibid.*, 794 and 797.

[51] *Simples* VI, 1 (ed. Kühn, XI, 798–807). Scarborough and Nutton, "Preface," 225–27 (wormwoods).

[52] Cf. Dioscorides I, 103. This is *Vitex agnus-castus* L. (ed. Kühn, XI, 807–10).

[53] Scarborough and Nutton, "Preface," 219 (dog's tooth grass: *Cynodon dactylon* [L.] Pers.). ed. Kühn, XI, 810–11.

[54] Ed. Kühn, XI, 811–13. Cf. Dioscorides IV, 23. This is *Anchousa tinctoria* L.

[*agarikos*],[55] and so on, so that by the end of Book VI of *Simples*, Galen has reached *iota* in what has become an alphabetical listing of simples (all plants) with some properties given according to "heating" and "cooling." Books VII and VIII[56] complete the alphabetical listing of herbs and their properties by their classes of heating and cooling qualities. *Simples* IX, 1.1–4 is "Earths,"[57] IX, 2.1–21 "Stones,"[58] and "Things Mined as Drugs" [*metallika pharmaka*] is *Simples* IX, 3.1–40.[59] Most of these substances are in alphabetical order, with some exceptions suggesting possible corruptions in the Greek texts. *Simples* X is what we would call "animal products," and much as had Dioscorides often prescribed blood for various ailments, so too does Galen extrapolate on this "humor" as a drug along with a number of other materials presumably classed with blood because they emerge from animals; the listing in and of itself is instructive, not so much for what Galen recommended, but for the substances he found listed in his sources (Xenocrates seems to be a major authority).[60] After listing various animal bloods (dove, bat, rabbit, deer, rooster, male goat, lamb, bear, bull, green frog, crocodile and lizard),[61] one reaches a "dairy product" listing (milk, cheese, butter, rennet, seal rennet),[62] followed by biles, perspiration, urine, saliva, and various kinds of animal and bird dungs and manure.[63]

In Book XI of *Simples*, Galen lists other "animal products,"[64] ranging from the flesh of poisonous snakes, marrow, and the liver of a mad dog,[65] to spider webs, blister beetles, cicadas, castor, brains of various animals, eggs, and charred crabs.[66] *Simples* XI, 2 is a collection of oddments that could be labeled "products of the sea useful in medicinals,"[67] and here are sponges, garum, coral, various sorts of salts and salt products including *asphaltos*.[68] Unlike the herbs and plants of *Simples* VI–VIII, which are given alphabetically, Galen's animal products and sea-medicines seem entered according to another pattern, perhaps ultimately derived from Dioscorides or earlier data found in some of the Hippocratic texts. In sum, Galen lists about 440 different plants in his accounting of herbs in *Simples* I–VIII, and about 250 other substances in the remaining books as useful in making drugs. Indeed, there are caustic remarks concerning the drugs of Xenocrates, especially the varieties of dung, but Galen *does* list them, and one can presume that such materials had long standing in ancient pharmacology, verified by a comparison with medicinals suggested by writers in the Hippocratic *corpus*, Dioscorides, as well as the magical papyri.[69]

Once the alphabetical and non-alphabetical listings of drugs are completed in *Simples*, Galen apparently decides to approach pharmaceutical lore in another way in the ten books we have as *Compound Drugs Arranged by Location of Ailment*.[70] These ten books were written after Galen had put down the *Method of Healing*,[71] whereas the *Simples* predates it.[72] Galen's struggle with drugs—and how to classify them—can be discerned through the successive attempts he made to provide lucid catalogues: first is his *Properties of Cleansing Drugs*, writ-

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[55] Ed. Kühn, XI, 813–14. As this is a shelf-fungus, the passage shows Galen's ignorance. G. Maggiulli, *Nomenclatura micologica latina* (Genoa, 1977), 85–87. Cf. Dioscorides III, 1.

[56] Ed. Kühn, XII, 1–158.

[57] *Ibid.*, 165–92.

[58] *Ibid.*, 192–208.

[59] *Ibid.*, 208–44.

[60] *Simples* X, preface (ed. Kühn, XII, 245–53).

[61] *Simples* X, 2–6 (ed. Kühn, XII, 256–63).

[62] *Simples* X, 2.7–12 (ed. Kühn, XII, 263–75).

[63] *Simples* X, 2.13–29 (ed. Kühn, XII, 275–308). *Simples* X, 2.15 (ed. Kühn, XII, 284–88) ends with Galen noting that "drinking the urine of a prepubescent boy is not recommended," and *Simples* X, 2.16 (ed. Kühn, XII, 288–90: on salivas) has a rare direct quotation from Nicander (*Theriaca* 86). *Simples* X, 2.17 (ed. Kühn, XII, 290) summarizes why one uses such materials. Cf. Paul of Aegina VII, 3, *s.v.* κόπρος (ed. Heiberg, II, 228).

[64] Ed. Kühn, XII, 310–77.

[65] *Simples* XI, 1.1 (snakes, esp. the *echidnē*: Scarborough, "Nicander's Snakes" [n. 15 above], 7–8); XI, 1.3 (marrow); and XI, 1.10 (rabid dog's liver). ed. Kühn, XII, 311–23, 311–33, and 335.

[66] *Simples* XI, 1.23 (spider webs); XI, 1.44–45 (blister beetles); XI, 1.36 (cicadas); XI, 1.15 (castor); and XI, 1.31 (brains, kidneys, and eggs). Ed. Kühn, XII, 343, 363–64, 360, 337–41, and 349–55. Charred or burned crabs, or more accurately the ashes of crabs, are prescribed in *Simples* XI, 1.24 (ed. Kühn, XII, 356–59). → J. Scarborough, "Some Beetles in Pliny's Natural History," *Coleopterists Bulletin*, 31 (1977), 293–96 ("Spanish Fly" and beetles of Lyttinae) and (same author), "Nicander II," 13–14, 20–21, 73–80 with nn. 134–45, 215–30, and 237–325 (blister beetles, descriptions, and purported remedies for the ingestion of "Spanish Fly" in classical antiquity); and (same author), "The Drug Lore of Asclepiades of Bithynia," *PH*, 17 (1975), 43–57 (51: castor).

[67] Ed. Kühn, XII, 369–77.

[68] *Simples* XI, 2.11 (sponges); XI, 2.12 (garum); XI, 2.3 (coral); and XI, 2.5–10 (salts and salt products). Ed. Kühn, XII, 376, 377, 370–71, and 372–75. For garum, see R. I. Curtis, "In Defense of *Garum*," *CJ*, 78 (1983), 232–40, and [same author] "The Garum Shop of Pompeii," *Cronache Pompeiane*, 5 (1979), 5–23. For sponges, see J. Théodoridès, "Considerations on the Medical Use of Marine Invertebrates," in M. Sears and D. Merriman, eds., *Oceanography: The Past* (New York, 1980), 734–49 (esp. 734–36).

[69] Cf. *PGM*, I, 224–25; IV, 1439–40, 2574–75, 2585, 2651; VII, 486; XII, 410, 414.

[70] Ed. Kühn, XII, 378–1007, and XIII, 1–361.

[71] *Drugs by Location* I, 1 (ed. Kühn, XII, 378).

[72] Ilberg, *Schriftstellerei*, 89.

ten before A.D. 169;[73] then Galen wrote the second of his "drug books," *Simples*, probably in the 170s, number six on the list of the works as suggested by Ilberg, after Galen's return to Rome in 169;[74] *Location* was written sometime in the period between A.D. 180 and 193, preceded by *Compound Drugs Arranged by Kind*.[75] Even though Ilberg shows that *Drugs by Kind* was composed before *Drugs by Location*, the Kühn edition places *Location* previous to *By Kind*, so that the following synopsis proceeds according to the unfortunately erroneous order (which has become traditional) set down in the Kühn volumes. Both *Drugs by Location* and *Drugs by Kind* indicate Galen's continual efforts to obtain clarity in description of medicinals, and Ilberg rightly notes that these two collections of drug lore came from Galen's pen very close to one another in time, perhaps in the two or three years preceding the fire in the Temple of Peace in A.D. 192.[76]

The arrangement of drugs in *Location*, so Galen writes,[77] is inspired by the example of Hippocrates, and would seem to show an order of the simplest sort: a beginning with affections of the head would lead, naturally enough, to ailments to be treated as one proceeds down from the head through other parts of the body (each with its own malfunctions: *tou kamnontos krasis hē te tou paschontos moriou physis*[78]), a manner called in the later Latin tradition, *a capite ad calcem*. What follows in *Drugs by Location* is a series of suggestions for various problems, indicative more of an "upper class" practice and a culling of beauty-care manuals than of Galen's original intent to organize drug lore in a logical head-to-toe pattern. Titles of the sections delineate the subject matter of *Drugs by Location*, almost in contradistinction to what Galen has said he wants to do in the short preface: "Alopecia," "On Hair Loss," "On the Coloring of Hair," "Drugs for Broken Hair," "Thin Hair," "On Hair that is Dying," and "Dandruff."[79] Much of this material comes from quoted extracts of Criton's books on drugs,[80] in turn extracting earlier sources on pharmaceuticals under the names of Archigenes, Cleopatra, and Apollonius.[81] Book II of *Drugs by Location* has recipes from a number of sources on "illnesses of the head,"[82] but most of the prescriptions for ear and nose problems are in Book III,[83] and the list of "authorities" has expanded to include Damocrates (recipes in poetry), Heras, Apollonius, Archigenes, Andromachus, Xenocrates, Harpalus, Harpocrates, Solon the Dietician, Zoilus the Ophthalmologist, Asclepiades, Charixenus, Antonius Musa, Heraclides of Tarentum, etc.[84] Eye diseases and numerous *kollyria* recipes comprise *Location* IV,[85] and more "beauty aids" for eye-bruises and black eyes begin *Location* V,[86] followed by lachrymal fistulas,[87] and salves, ointments, and plasters for the forehead, along with a great number of mouthwashes, dentifrices (Damocrates' poems) and treatments for various tooth problems.[88] Stomach soothers and gargles form Book VI,[89] congestion relievers and arteriaces are Book VII,[90] but *Drugs by Location* IX contains a melange of remedies, including internal treatments for jaundices and affections of the spleen, followed by hemorrhoids, priapism, anal suppositories, and finally a recipe for the treatment of "uterine suffocation."[91] Book X provides recipes for the treatment of kidney problems, gout, sciatica (*ischias*), and arthritis,[92] and at one point where a poem of Damocrates is being quoted for a cure of sciatica, there is clear indication that an illustrated text has been consulted.[93] *Compound Drugs Arranged by Location of Ailment* does not emerge as a complete and coherent tract on drug lore, but seems to be a potpourri of recipes collected and loosely grouped by external parts, emphasizing the head, with sections on gout, sciatica, and the like that might formally qualify the work as a "head-to-toe" treatise.

The third of Galen's massive pharmaceutical

[73] Ed. Kühn, XI, 323–42. Ilberg, *Schriftstellerei*, 77.
[74] Ilberg, *Schriftstellerei*, 89.
[75] *Ibid.*, 20–23 and 84.
[76] *Ibid.*, 84.
[77] *Drugs by Location* I, 1 (ed. Kühn, XII, 381).
[78] *Ibid.* (ed. Kühn, XII, 378).
[79] *Drugs by Location* I, 2–9 (ed. Kühn, XII, 381–497).
[80] On Criton, physician to Trajan (A.D. 98–117), see E. Kind, "Kriton (7)," *RE*, Vol. XI, part 2 (Stuttgart, 1922), cols. 1935–38, and J. Benedum, "Kriton," *RE*, Supplementband XIV (Stuttgart, 1974), cols. 216–20.
[81] Fabricius, 198–99 (Archigenes), 180–83 (Apollonius).
[82] Ed. Kühn, XII, 498–598.
[83] *Ibid.*, 599–695.
[84] Fabricius, 189–90 (Damocrates), 183–85 (Heras), 180–83 (Apollonius), 198–99 (Archigenes), 185–89 (Andromachus the Younger), etc. M. Wellmann, "Beiträge zur Quellenanalyse des Älteren Plinius," *Hermes*, 59 (1924), 129–56 (140–42; Xenocrates; 142–43: Solon).
[85] Ed. Kühn, XII, 696–803.
[86] *Ibid.*, 804–93.
[87] *Ibid.*, 820–22.
[88] *Ibid.*, 889–93 (Damocrates' poems).
[89] Ed. Kühn, XII, 894–1007.
[90] Ed. Kühn, XIII, 1–115.
[91] *Ibid.*, 228–320. "Uterine Suffocation": *Location* IX, 10 (ed. Kühn, XIII, 319–20). Cf. *PGM*, VII, 260–71, and Soranus, *Gynecology* III, 50 (ed. Ilberg, pp. 127–28).
[92] Ed. Kühn, XIII, 321–61.
[93] *Ibid.*, 351.

works is titled *Compound Drugs Arranged by Kind*.[94] It seems that Galen had been attacked by other physicians for his earlier writings on drugs,[95] which had omissions and faulty principles of organization; it also seems apparent that he wrote *Drugs by Kind* late in life, after the fire at the Temple of Peace in A.D. 192.[96] He will stick by his "system of degrees" as developed in the *Simples*, but he has shifted somewhat as he begins to write this "third approach" to drugs, taking up the venerated "treatment by contraries."[97] What follows in the seven books of *Drugs by Kind* is compilation accompanied by commentary, interspersed by recipes, and the remedies "work" according to the theory of treatment by contraries. An odd sort of fuzziness characterizes the initial chapters of *Drugs by Kind* I, but there is a greater care with sources than one finds in Galen's earlier treatises on pharmacy, illustrated by the subtitles: "A White [Plaster] from [White] Pepper, as Compounded by Attalus and Heras," followed by "Attalus, as Quoted by Andromachus, on the Compounding of a White [Plaster] for a Small Wound by a Rabid [Dog] and for Wounded *Neura*."[98] Heras was an authority on rabies,[99] but Galen is concentrating his attention in Book I of *By Kind* on the white color of the plasters under discussion, and he ends the book with a quotation from Damocrates' medical poem, "On the White Plaster."[100] Green plasters occupy Galen in *By Kind* II, 2–4 (Kühn, XIII, 470–99), but *By Kind* II, 3 (Kühn, XIII, 496) shows that Galen is *not* arguing that the similarities of color give certain "related" plasters their effectiveness, but that their similarity of properties (*dynameis*) provide their usefulness—even though he condemns Andromachus for taking color as a guide. *By Kind* II, 5 (Kühn, XIII, 499–503) is "Drugs That Can be Wiped Away Quickly," and here are salves and oily ointments as cited (without specific recipes) from Criton, Heras, Archigenes, Philip, Menecrates, and other authorities. *By Kind* II–IV contain a large number of suggestions on plasters, drugs for wounds of the *neura*, and drugs for promoting the healing of wounds and ulcerations, as well as plasters and ointments that helped form scar tissue (cicatrization), culled from a number of sources.[101] Book V of *By Kind* (Kühn, XIII, 763–858) might be titled "Multi-Purpose Drugs," and Galen gives a dazzling display of his purported knowledge of pharmaceuticals—or at least his command of the written sources that have recorded such multiple-use drugs. In *By Kind* V, 1 (Kühn, XIII, 763–65), Galen restates his basic, underlying theory of drugs by describing them all, in the first place, as characterized by the hot, the cold, the dry, and the wet, and then, consequently, considering the compounding from simples of these drugs according to their dominant quality; this, in turn, would indicate how these compound medicinals would perform according to their "thinning" properties, "thickening" properties, "promotion of scarring" properties, induction of flesh-growth properties, and so on. Only in this way, Galen insists, can one comprehend why drugs work as they do. Formulas abound. Authorities appear in a rapid blur, and the list of names cited in Book V of *By Kind* indicates which sources Galen had at his disposal, and will provide part of the pattern through which Byzantine medical writers would use *their* sources—whether through Galen or independently.[102]

Book VI of Galen's *Compound Drugs Arranged by Kind* (Kühn, XIII, 859–945) takes up the subject of multi-use plasters. First comes a "Preface" (*By Kind* VI, 1 [Kühn, XIII, 859–62]) in which Galen notes that the previous book of *By Kind* has considered the plasters called *poluchrēstoi*, designated as

[94] Ed. Kühn, XIII, 362–1058 (in 7 books).

[95] *By Kind* I, 1 (ed. Kühn, XIII, 363).

[96] *By Kind* I, 1 (ed. Kühn, XIII, 362).

[97] *By Kind* I, 1 (ed. Kühn, XIII, 367).

[98] *By Kind* I, 13–14 (ed. Kühn, XIII, 414–27).

[99] *By Kind* I, 16 (ed. Kühn, XIII, 431–42: Heras on hydrophobia, accompanied by Xenocrates).

[100] *By Kind* I, 19 (ed. Kühn, XIII, 455–57).

[101] Ed. Kühn, XIII, 503–762.

[102] Heras of Cappadocia, Epigonus, "from the Temple of Hephaestus at Memphis" (a plaster made from dittany [Kühn, XIII, 778–80]), Hicesius, Criton quoting Heras, Criton quoting Hicesius, Andromachus, Criton quoting the recipe of the "Medicine of Machairon" for the healing of all kinds of wound (Kühn, XIII, 796–97), Criton quoting Damocrates, Asclepiades (*By Kind* V, 4 [Kühn, XIII, 801–2] along with a recipe compounded by Galen), Phylacus quoting Diophantus the surgeon, Andromachus on green plasters (quoting Evagrius, Epicurus, Alcimonius or Nicomachus), Heraclides of Tarentum quoting Hicesius, Philoxenus, Damocrates' poem on making a plaster from dittany (*By Kind* V, 10 [Kühn, XIII, 820–23]), Asclepiades quoting Aristarchus of Tarsus (V, 11 [Kühn, XIII, 824–25]), Andronius, Terentius, Areius, [Scribonius] Largus (Kühn, XIII, 828), Threptus, Hierax of Thebes, Lucius, Magnus of Philadelphia, Gaius of Naples, Agathinus, Mnesitheus, Apollophanes. Nicolaus, Petronius, Agathocles, Achilla (Kühn, XIII, 834), Isidorus, Alcimion quoting Apollonius Archistrator on the "pill that acts like a scalpel" (Kühn, XIII, 835), Glaucius, Tiberius Caesar, Phanius, Antipatrus, Publius, Philinus, Melitonus, Apollonius of Tarsus, Asclepiades quoting Marcellus, Xenocrates from his work *Drugs from Vetch* (Kühn, XIII, 846), a recipe of Serapis "set up on metal plates: a fleshmaker" (Kühn, XIII, 847), Tryphon, Heliodorus, Ptolemy, Eunomus, Theotropus quoting Areius, Apelles, and Cleobulus. Galen has gained most of these names and recipes through the collections of Andromachus, Asclepiades, and Criton.

those preparations to be "laid on" for treatment of open sores, ulcers, and the like, either to cause them to heal rapidly, or to cause them to remain open, according to the course of therapy prescribed by the physician. Galen says he has observed the compounding of such drugs during his frequent travels, and how he will, now, record some further "wide-use" plasters, but only after he has verified their efficacy in his own experience with patients. These plasters are those which are employed for flesh that is rotting or semi-putrified, and he will begin with plasters made from herbs. But instead of a formula designated by some geographic location, Galen starts his account by quoting Criton's "Plaster from Herbs" (*By Kind* 2 [Kühn, XIII, 863–64]), with measurements. One wonders what happened to Galen's gathered drug lore, presumably recorded from his travels, when he proceeds to explain why *Criton's* formula would contain poppies (*mēkōn*: *Papaver* spp.), black henbane (*hyoskyamos*: *Hyoscyamus niger* L.)—these would give the "cold"—and the scarlet pimpernel (*anagallis*: *Anagallis arvensis* L.), which would provide the "drying property." Following in *By Kind* VI, 1 (Kühn, XIII, 869–73) is a "Squill Plaster" (*skilla*: *Urginea maritima* [L.] Baker), again probably from Criton's collection, and Galen commends this formula provided one tempers it with wax (Kühn, XIII, 871). After discussing further recipes from Criton and Andromachus,[103] Galen proceeds to the vexed question of weights and measures: after his valuable discussion of how weights and measures are calculated in Italy, Greece, Alexandria, and Ephesus, it seems clear enough that Galen is rather frustrated by the inexactitude of the formulas he has received in the pharmacological sources, and especially by the inexact equivalences that seem to thwart his reproducing the formulas to his satisfaction.[104] Adromachus continues to supply Galen with the listed plaster recipes, until one reaches "A Tyrian Plaster" (*By Kind* VI, 12; [Kühn, XIII, 915–23]), which turns out to be another medical poem by Damocrates, not an original formula from Phoenician Tyre as might have been recorded by Galen.[105] The confused nature of Galen's drug formulas in *By Kind* may be illustrated by an example from the listings of *malagmata*, "emollient" or "soft" plasters. *By Kind* VII summarizes *malagmata* with an apparent strained classification system, as Galen tries to distinguish them from other plasters,[106] and Galen's quotation from Heras on a compound called the *kērelaion* shows how Galen's written sources had confused the specific names of these drugs—and by implication why the best of the Byzantine writers on pharmacy did *not* use Galen as an exact blueprint:

> *Kērelaion*: Praised by Heras above all among Drugs. "Take freshly defibered clear fat, 44 [Roman] ounces, 24 ounces of beeswax, 6 ounces of cerussite,[107] 6 ounces of massicot,[108] and dissolve together the dry ingredients, and shortly they will become congealed." Heras said "the beeswax and the clear fat are the softening properties." Thus if some beeswax would be mixed with a little oil, you will make what is called by the doctors a *kērelaion*, a wax-oil.[109] But clearly the oil ought not to be called either the squeezings of unripe grape [*to omphakinon*] or oil of unripe olives,[110] nor should one assume the addition of the oil of palm leaves.[111]

The remainder of *By Kind* VII[112] continues in this confusion, with numerous quotations from Damocrates, Andromachus, Asclepiades (probably the "Younger," or Pharmacion), and other names now familiar from other Galenic drug books. One may suspect textual corruptions in the Kühn Greek, but interpolations do not explain away the rampant disorder in drug classifications, except for the broad categories of plasters, emollients, earths, herbal simples, and the like. Even though Galen has a reasonably clear theory of drug action, it is smothered by the numerous and often contradic-

[103] Of interest in terms of preparation technique is "A Plaster from a Whetstone," i.e., a powdered compound rubbed on a whetstone (ed. Kühn, XIII, 874–82; cf. Dioscorides I, 98). Criton also provides Galen with a formula from Heras (*By Kind* VI, 3 [Kühn, XIII, 882–83]), another by Serapion (*By Kind* VI, 4 [Kühn, XIII, 883–84]), and another by Andromachus (*By Kind* VI, 5 [Kühn, XIII, 884–85]). Galen seems to take some data directly from Andromachus (quoting Isidore of Antioch) on a plaster for gangrene (*By Kind* VI, 6 [Kühn, XIII, 885–86]). Then Galen tells us he will take up other sorts of plasters, arguing at some length that one ought not to be ignorant of the good data at one's fingertips—unlike so many in his day (*By Kind* VI, 7 [Kühn, XIII, 889]), and then we receive a formula (again from Andromachus) for the Egyptian *Phaia*[?] Black[?] Plaster (*By Kind* VI, 8 [*Kühn*, XIII, 890–91]), a good example of an excellent compound ignored by physicians (Kühn, XIII, 891).

[104] Ed. Kühn, XIII, 895–97.

[105] *By Kind* VI, 12 (Kühn, XIII, 915–23).

[106] *By Kind* VII, 1 (Kühn, XIII, 946–51).

[107] $PbCO_3$, lead carbonate, or "white lead" (*Psimythion*). Preparation of white lead: Theophrastus *On Stones* 56. Preparation of white lead salves: *Geoponica* XVII, 7.2; XVIII, 15.3; and VII, 15.18 (ed. Beckh, pp. 473, 494 [from Didymus], and 203 [from Sotion]). Cf. Dioscorides V, 82 and 88.

[108] PbO, lead monoxide (*lithargyros*). Cf. *PGM*, XII, 194; Nicander *Alexipharmaca*, 594; Galen, *Drugs by Kind* I, 5: "Plasters Made from Lead Monoxide" (Kühn, XIII, 394–98).

[109] This is Galen's "cooling wax salve" in *Hygiene* VI, 14.8 (ed. K. Koch, *Galeni De sanitate tuenda* [Leipzig, 1923; in *CMG* V 4, 2], p. 195).

[110] Theophrastus, *On Odors* 15. Dioscorides I, 30.

[111] *By Kind* VII, 2 (Kühn, XIII, 952–53).

[112] *By Kind* VII, 4–16 (Kühn, XIII, 958–1058).

tory quotations from earlier sources, and Galen's attempts to "explain" why various drugs might be included in the works of Criton, Andromachus, Damocrates, and others, are often surprisingly feeble. Galen generally has not actually sought out the drugs he prescribes—as he likes to boast—but has availed himself of a rich doxographical tradition in Greco-Roman pharmacy, a tradition that was exploited earlier by Criton in the reign of Trajan,[113] and by Dioscorides in the middle of the first century. Unlike Dioscorides, however, Galen did not simply survey his predecessors' work,[114] but excerpted those tracts in large swatches. Once the early Byzantine pharmacologists had analyzed Galen's "Drug Books," they were forced to rearrange, streamline, and "edit them" rather heavily, even though Galen remained a venerated fountainhead of drug lore. It is very significant that Byzantine medical writers, from Oribasius through Paul of Aegina, quite frequently sought out the "original" writings on drugs from earlier Greco-Roman antiquity, and did not continue the pharmaceutical doxography illustrated by Galen's summaries in the late second century.

Oribasius and Pharmacology

Oribasius functioned as court physician to the Emperor Julian (A.D. 361–363), but he had been friend and confidant of Julian before the eventful months of 360 and 361 that led to his elevation to the undisputed possession of the imperial purple. Oribasius had prepared a synopsis of Galen's works at Julian's request, while the future emperor served Constantius as Caesar in Gaul.[115] In 360—again at the request of Julian—he compiled a second work that summarized not only Galen but also many other medical authorities, and we have forty books plus a number of fragments of the original seventy in this *Medical Collection*. From the *Medical Collection*, one may gauge how Galen's pharmacology was employed by Oribasius, and one may also discern some skillful rearrangements, reclassifications, and fresh juxtapositions as Galen is quoted directly. In many respects, Oribasius' use of Galen's works provides a reasonable measure of what tracts by Galen were known in the mid fourth century, and the numerous quotations from all three of Galen's massive pharmacological books show that they all should probably be included within the "genuine" Galenic corpus. *Antidotes* is also excerpted,[116] but not to the extent that Oribasius uses Galen's *Mixtures and Properties of Simples* (593 citations), *Drugs by Location* (206 citations), and *Drugs by Kind* (62 citations). *Theriac to Piso* does not appear among the quoted extracts.

These raw numbers (almost 600 extracts from Galen's *Simples*, just over 200 from *Location*, and 62 from *By Kind*) may suggest a basic pattern for Oribasius' adaptation of Galenic pharmacology. In the first place, Galen's *Simples* had laid down a fairly precise theory of drug "properties," and this tract also included almost all of the listed medicinals known to Greco-Roman pharmacy; secondly, since Oribasius does not quote Damocrates' medical poems (nor any medical poetry at all), this would suggest that Oribasius valued *Location* and *By Kind* (in which Damocrates' poems bulk large) less than *Simples*, or, that medical poetry had fallen out of fashion by Oribasius' day; third, since Galen had given a fairly complete listing of pharmaceuticals in *Simples*, first listed alphabetically (the plants) and then "classed" by source (animals, minerals), Oribasius apparently assumed Galen's *Simples*, combined with the rearranged alphabetical listing of drugs taken from Dioscorides' *Materia medica*,[117] would provide the important substances used in pharmaceutical therapy; Galen's two other books on drugs (*Drugs by Location* and *By Kind*) did not offer a significant improvement in perceptions of drug lore. Moreover, Galen's *Location* and *By Kind* merely repeated the substances (using other authorities) previously listed in his simples, so that there was no quantitative improvement in Galen's nearly 450 drugs contained in his *Simples* that could not be gained by the more streamlined listing of pharmaceuticals from Dioscorides. Oribasius can thus assume his pharmacology would include all of the over 600 "standard" drugs by a judicious combination of Galen and Dioscorides, as well as careful quotations from other authorities directly from their works. Oribasius' arrangement of drugs most likely resulted from the requirements of an active and personal practice of medicine—particularly seen in the quotations of Galen's *Simples* in *Medical Collection* XV—and his adaptation of drug lore became a standard method in medical botany and

[113] See n. 80 above, and J. Scarborough, "Criton, Physician to Trajan: Historian and Pharmacist," in J. Eadie and J. Ober, eds., *Festschrift Chester Starr* (Washington, D.C., 1984) in press.

[114] Scarborough and Nutton, "Preface," 190.

[115] Oribasius, *Medical Collection* prooemium 1–2 (ed. Raeder, I, 4).

[116] Raeder, IV, 327 (nine citations).

[117] Oribasius, *Medical Collection* XI–XIII (ed. Raeder, II, 80–180).

pharmacology still followed in modern times.[118]

Galen's *Simples* had developed a tight theory of pharmaceutical action, based upon primary "qualities" (viz. properties) of particular classes of drugs, followed by a second set of secondary "qualities," and then a third classification of tertiary properties.[119] Galen had argued that the Hot, Cold, Wet, and Dry were common to all substances, and that changes came to matter through either active or passive influences.[120] This, in turn, explained the effects of all drugs.[121] Following from this premise, Galen can then argue for "secondary" properties and "tertiary" properties from the pharmaceutical effects derived from combinations and mixtures of the "primary" properties, as such would be perceived by the senses.[122] There is, however, a vagueness to Galen's "tertiary" qualities/properties, and Harig has shown that Galen meant merely "local effects" in his "tertiary level," that is, local effects of the "secondary qualities."[123] Thus in the beginning of Book V of *Simples*, Galen can make the statement that it is better to classify pharmaceutical compounds by their *eidē* ("species" or "kinds"),[124] apparently meaning their "useful effects" in pharmacy as they are perceived by the senses. By way of illustration, Galen writes that it is more accurate to say that wheat-meal plaster is a balance between the Wet and Hot,[125] rather than to list the plaster's qualities/properties as pus-producing, soothing, cathartic, and relaxing.[126]

Oribasius does some very significant things with Galen's drug theory, and the following can only be suggestive. In quoting from Galen's *Simples* V, 2,[127] Oribasius merely excerpts what Galen has to say about the "utility of drugs" (*peri chreias tōn pharmakōn*), the basic statement of how one understands drug action. Oribasius has, in effect, extracted exactly those passages from Galen's verbose description of drug properties which are precise and clear: "The utility of drugs among men is often from this alone: the heating, cooling, drying, and the moistening, or from the combination of effects as produced [by these properties]." Oribasius includes Galen's assumptions that such physical properties as condensation of drugs, rarifaction, and so on, would also be explained by the underlying theory of *stoicheia/dynameis*, but the repetitive passages following line 5 (Kühn, XI, 707) are not quoted. *Medical Collection* XIV, 4 (Raeder, II, 184–85), is not a continuation of Galen's *Simples* V, but begins with an excerpt from *Simples* III, 11 (Kühn, XI, 564–65), titled by Oribasius "How One Determines the Elementary Property of the Full Compound by Comparison with an Exactly Balanced Substance." *Simples* III, 11 is employed here because Galen has defined a "moderate *krasis*" (a "balancing," or in archaic English, a "temperament"), and such is determined by the sense of touch. *Medical Collection* XIV, 4.1–3, is extracted from Galen's *Simples* III, 11, but *Medical Collection* XIV, 4.4 is from *Simples* III, 13 (Kühn, XI, 571). Oribasius again has skipped an incredibly verbose and repetitive section of Galen's *Simples*, and extracts exactly those passages which summarize precisely what Galen means in terms of his mid-way *krasis*, after Galen has provided an excellent illustration of the cooling properties of rose oil in *Simples* III, 11. Oribasius has shown his shrewd adaptation and rearrangement of Galen, and the *Medical Collection* becomes an attempt to give Galen a clarity—using his own words—lacking in the original texts. Oribasius also has digested an enormous quantity of Galen's writing, no mean feat in itself, and has simplified Galen's tripartite "intensity theory" of drugs so that the original notion is preserved for the employment of future physicians and pharmacologists. In fact, as Harig has argued, Oribasius' quotations of Galen's *Simples* ensured the preservation of the most essential parts of Galen's theory, shorn of the vague and generally unsatisfactory extension of the theory into a "tertiary" level of effects.[128]

Oribasius exhibits great care in citing his sources. One would expect him to cite materials as he had found them quoted in earlier compendia of recipes, such as are found in Galen's *Drugs Arranged by Location of Ailment* and *Drugs Arranged by Kind*. A few examples of sources cited by name, compared to the sloppy manner of Galen's use of recipe col-

[118] G. Harig, "Die Galenschrift "De simplicium medicamentorum temperamentis ac facultatibus" und die "Collectiones medicae" des Oribasios," *NTM*, 7 (1966), 1–26 [4].

[119] See G. Harig, *Bestimmung der Intensität im medizinischen System Galens* (Berlin, 1974), *passim*.

[120] Galen, *Elements According to Hippocrates* I, 9 (ed. Kühn, I, 485), and *Commentary on Hippocrates' On the Nature of Man* I, 7 (ed. J. Mewaldt, *Galeni In Hippocratis de natura hominis* [Leipzig, 1914; in *CMG* V 9, 1], p. 22).

[121] Galen, *Simples* I, 8 (ed. Kühn, XI, 397).

[122] Galen, *Simples* III, 13, and V, 2 (ed. Kühn, XI, 573 and 709–10).

[123] Harig, *Intensität* (n. 119 above), 110–15.

[124] Galen, *Simples* V, 1 (ed. Kühn, XI, 704–6).

[125] Galen, *Simples* V, 2 (ed. Kühn, XI, 712).

[126] Galen, *Simples* V, 2 (ed. Kühn, XI, 711–12).

[127] Oribasius, *Medical Collection* XIV, 3 (ed. Raeder, II, 184) = ed. Kühn, XI, 706–7.

[128] Harig, "Oribasius" (n. 118 above), *passim*.

lections by Criton, Andromachus, and Asclepiades the Pharmacist, will suggest Oribasius' meticulous care and insistence on quoting *directly* from the original work. It will be recalled that Galen cites Xenocrates for a number of animal-derived drugs,[129] and one would, presumably, expect Oribasius to pick up these citations and record them somewhere in the *Medical Collection*. Except, however, for some scholia recording parallel passages from Xenocrates, Galen, and Dioscorides,[130] and one fragmentary quotation (twenty-one lines) from Xenocrates' "Plasters Made from Whelk [*kēryx*] and murex [shellfish],"[131] Xenocrates appears only in a lengthy, direct quotation from *Foods from Water Animals*,[132] which fits neatly into Oribasius' "elementary" books on preparation and recommendation of healthy foods. Here are how one classifies fish and shellfish,[133] and a catalogue of agreeable and disagreeable fish in the diet. No bloods, rennets, or dungs appear in Oribasius' quotations from Xenocrates, and one is again struck by the display of good judgment in the employment of an earlier source, quoted directly and not through an intermediary. Other quoted authors receive similar treatment (for example, the obscure Heraclas),[134] so that Oribasius has "gone to the sources," unlike his verbose model, Galen.

There is ample evidence throughout Oribasius' writing—*Medical Collection*, [*Medical*] *Synopsis for Eustathius*, and [*Medical*] *Books for Eunapius*—not only that he had read and assimilated the writings of many authorities of medicine in the Greco-Roman tradition, but also that his medical practice included much personal knowledge of pharmaceuticals, which he was pleased to share with his son, and with his friend Eunapius. A few examples will illustrate. *Medical Collection* IX, 27 (= *Synopsis for Eustathius* III, 79 [Raeder, II, 30, and Raeder, ed., *Synopsis*, 89]) is "Plasters from the Husks of Wheat." He tells us that one can use the "leftovers" of the wheat by pounding the husks, and the plaster (made from combining the pounded husks with a honey-vinegar mixture and a gum ammoniac [here probably *Ferula communis* L. or *F. marmarica* Asch. & Taub.; less likely *Dorema ammoniacum* D. Don.]) would be useful as a warming plaster for various skin ailments as well as liver and spleen problems. No source is discernable here, and there is only a slight resemblance to the mention of gum ammoniac by Dioscorides;[135] the suggestions by Dioscorides for *ammōniakon* in *Materia medica* III, 84 (Wellmann, II, 100–102) overlap with those by Oribasius only in terms of being useful for ailments of the liver and spleen (*Materia medica* III, 84.3 [Wellmann, II, 102]), but there is no combination with pounded husks of wheat. It is signifcant that Aetius borrows this account of the plaster of pounded wheat husks directly from Oribasius.[136] Thus, it is apparent that Oribasius was a skilled drug compounder in his own right, also shown by other adapted and "original" medicines.[137] Characteristic of Oribasius' command of drug compounding is his direct simplicity and general avoidance of complicated mixtures that might require exotic ingredients.

Oribasius was also well acquainted with Dioscorides' *Materia medica*, but he—like Galen before him—decided that Dioscorides' precise and difficult system of drug affinities was either too cumbersome for practical use,[138] or too diffuse as it stood. *Medical Collection* XI–XII (Raeder, II, 81–159) is an alphabetized listing of the simples in Dioscorides' *Materia medica* (456 substances, including some of Dioscorides' "animal products," for instance, *stear* ["fat"]), and *Medical Collection* XIII (Raeder, II, 160–80) is "From Dioscorides on the Properties [*Dynameis*] of 'Mined' Drugs [*Metallika*] and their Preparation" (88 medicinals, including various stones and earths). Oribasius has carefully alphabetized 544 pharmaceuticals as contained in Dioscorides' *Materia medica*, and there is, indeed, a succinct clarity that would be absent in Dioscorides' original tract. One can suppose that Oribasius drew up this listing, or one may assume that he took a previously-compiled alphabetical listing and simply reproduced it. Given Oribasius' normal habit of citing almost all of his sources by name, it seems unlikely that he had borrowed the alphabetical register of

[129] Galen, *Simples* X preface (ed. Kühn, XII, 245–53).

[130] Oribasius, *Medical Collection* XI A 54, and XV (ed. Raeder, II, 89, 293, and 296).

[131] Oribasius, *Medical Collection* XV, 3 (ed. Raeder, II, 296–97.).

[132] Oribasius, *Medical Collection* II, 58 (ed. Raeder, II, 47–57).

[133] Oribasius, *Medical Collection* II, 58. 11–13 (ed. Raeder, II, 48).

[134] Oribasius, *Medical Collection* XLVIII, 1–18 (ed. Raeder, III, 262–68). See also C. L. Day, *Quipus and Witches' Knots: The Role of the Knot in Primitive and Ancient Cultures, with a Translation and Analysis of "Oribasius De Laqueis"* (Lawrence, Kansas, 1967), 107–31.

[135] Dioscorides III, 48.3 (ed. Wellmann, II, 62). Cf. Pseudo-Dioscorides, III, 84 (ed. Wellmann, II, 101).

[136] Aetius III, 178 (ed. Olivieri [*CMG* VIII 1], p. 350).

[137] E.g., Oribasius, *Synopsis for Eustathius* III, 77 (Raeder, p. 88) = *Medical Collection* IX, 25 (Raeder, II, 28–29): "A Plaster Made from Beer-Yeast."

[138] Scarborough and Nutton, "Preface," 190.

Dioscorides from an unknown source, and the accuracy of the quotations would indicate that Oribasius had performed this onerous task himself. If so, it may be quite probable that Oribasius' alphabetical text of Dioscorides is the archetype of many later manuscripts of the Greek "alphabetical" Dioscorides, including the justly famous Vienna text of A.D. 512.[139]

From Oribasius to Aetius

Although it can be argued that Theodorus Priscianus' *Euporiston* could be included in the scope of early Byzantine medicine (Priscianus was court physician in the reign of Gratian [A.D. 375–383]), the text was written in Latin, as befitted the court of a western Roman emperor.[140] Moreover, the fascinating farrago of drugs and folklore that make up the *De medicamentis* by Marcellus Empiricus (*fl.* as *magister officiorum* under Theodosius I [A.D. 379–395]),[141] will not be considered here, since the work is in Latin, and belongs more to the history of pharmacy in early medieval western Europe. Caelius Aurelianus (*?fl.* C. A.D. 450) has left us a masterpiece of compression—also in Latin—of the best of the Methodist physicians, and the drug lore of Soranus of Ephesus assumes a major importance.[142] And the compendium of Cassius Felix, called *De medicina*, was published in A.D. 447, with the *a capite ad calcem* therapeutics of Galen summarized in Latin guise.[143] One would like to know more about Hesychius of Damascus (*fl.* A.D. 430 in Byzantium), the father of Psychestrus, Asclepiodotus, and Palladius,[144] but as important as were these medical practitioners in the fifth century, we learn about them through isolated quotations in later authors and from summaries as contained in the *Suda* and Photius' *Library*.[145] Alexander of Tralles (V, 4 [Puschmann, II, 163]) gives us a tantalizing bit about Psychestrus' therapy using a "liquifying diet,"[146] and all of these names, excepting Alexander of Tralles, were associated with some residence or study at Alexandria, which continued to be a famous center for medical education of many varieties.[147] It is only with Aetius of Amida, who had indeed spent time in Alexandria,[148] in the early sixth century that one again can assess the next stages of development in early Byzantine pharmacology.

Aetius of Amida

Drug theory begins Aetius' account of medical practice. In fact, the lengthy *Preface* to Book I of Aetius' *Medical Books* (Olivieri, I, 17–30) is entirely devoted to theoretical pharmacology. The complete *Preface* emerges from Galen, but in a deftly arranged manner from several different Galenic passages, generally from *Mixtures and Properties of Simples*, with the first eighteen lines quoted from *Simples*, prooemium VII (Kühn, XII, 2–4). Even in English translation, one is able to detect Aetius' subtle yet crucial modulations of Galen's original, as well as the important reorganization of vital passages from Galen's pharmacological theory, so that clarity could replace imprecision:

> The variations of the individual effects of drugs are due to each of them being to a certain sufficiency [*tō epi tosonde*: "to a certain degree" is the modern expression] hot or cold or dry or wet, or each having fine [or "small"] or coarse [or "large"] particles [or "parts"]. The extent/measure of the degree, however, of the attachments [lit. "fastenings-together"] in each of the drugs cannot be expressed with truthful accuracy. But we have attempted to encompass and characterize them with adequately clear terms and definitions for use in medical practice [*eis tēn cheian tēs technēs*]. We are demonstrating that there is one kind [*hen genos*] of drugs which is [*aphiknoumenon*: lit. "arriving at" or "coming into"] a same *krasis* as our bodies, when it has received some *archē* of both change and alteration [*alliōsis*] from the hot in this kind of drugs, and, that there is another kind of drugs which is hotter. From this, it seems to me that four orders [*taxeis*] can be made: the first is indistinct [*asaphē*] to the senses, [and] detecting it necessarily comes through pure reason [*logos*]; the second is distinct and perceivable to the senses; the third is rather hot, but not to the point of burning; the fourth and last is the corrosive or caustic kind of drugs.[149] Likewise also for the cooling kind of drugs, the first order must come from pure reason in demonstrating its coldness, the second is cooling detectable by the senses, the third is rather cold, and the fourth causes

[139] Vienna, Österreichische Nationalbibliothek MS Gr. 1.

[140] V. Rose, ed., *Theodori Prisciani Euporiston* (Leipzig, 1894).

[141] Marcellus (ed. Liechtenhan).

[142] Caelius Aurelianus (ed. and trans. Drabkin).

[143] V. Rose, ed., *Cassii Felicis De medicina* (Leipzig, 1879).

[144] Hunger, "Medizin," 292. Temkin, "Byzantine Medicine," *DOP*, 16 (1962), 100 = *Double Face of Janus*, 205–6.

[145] On Jacob Psychestrus: R. Asmus, *Das Leben des Philosophen Isodorus von Damaskios aus Damaskos* (Leipzig, 1911), esp. 72–75.

[146] Cf. Alexander of Tralles, ed. Puschmann, I, 74, and reffs. Puschmann, II, 162 n. 1.

[147] Hunger, "Medizin," 292. Temkin, "Byzantine Medicine," 101–2 = *Double Face of Janus*, 206–7.

[148] Aetius I, 131, and II, 3 (ed. Olivieri [*CMG* VIII 1], pp. 65 and 154).

[149] *Pharmaka kaustika*. Galen, *Simples* V, 15 (ed. Kühn, XI, 754). Zopyrus in Oribasius, *Medical Collection* XIV, 57.1 (ed. Raeder, II, 226).

necrosis.[150] Analogous in these definitions are also the wetting and drying drugs.[151]

Galen (*Simples* VII, 10.1) then proceeds to speak of catnip (*kalaminthos*: *Nepeta cataria* L.),[152] writing "catnip is basically of small particles and has a hot and dry *krasis*, and is from the third order with both qualities."[153] Aetius, however, does not continue with *Simples* VII: the next twelve lines in the *Preface* to Book I of the *Medical Books* come from Galen, *Simples* III, 13 (Kühn, XI, 571–72):

> Thus let there be set down a clear instruction of these very degrees [or sufficiencies]: in the first order [*taxis*] of cooling drugs would be placed rose oil or the rose (*Rosa gallica* L., and related spp.) itself; in the second would be placed rose-juice [*ho to rhodou chylos*]; and in the third and fourth orders we would include—for good reason—the very cold drugs: hemlock (*kōneion*: *Conium maculatum* L.), the juice of the opium poppy (*mēkōneion*, viz. opium from *Papaver somniferum* L.), mandrake (*mandragoras*: either *Mandragora officinarum* L. [mandrake], or *Atropa belladonna* L. [deadly nightshade]), and black henbane (*hyoskyamos*: *Hyoscyamus niger* L.). Concerning the hot drugs, dill (*anēthon*: *Anethum graveolens* L.) and fenugreek (*tēlis*: *Trigonella foenum-graecum* L.) are in the first order; the drugs which appear next to them are in the second order; and in the third and fourth orders we would include the caustic and corrosive drugs. And in the same manner in regard to the wetting and drying drugs, one begins with a drug of moderate and proportionate [*krasis*], [and] we will make orders [*taxeis*] one after the other until the farthest extremes [*akroi*]. For some use of such knowledge is not unimportant in the medical practice [*methodos*].

Aetius now drops Galen's *Simples* III, 13 (which goes on to grumble about the general ignorance of doctors in such matters), and switches to an adaptation of *three lines* from Galen's *Simples* IV, 4 (Kühn, XI, 632), in which Aetius writes: "One should also use the sense of taste, and retain in the memory the peculiarity of each quality of the juices" (Olivieri, I, p. 18, lines 15–17); and then Aetius shifts again to four, slightly modified lines from Galen, *Simples* I, 39 (Kühn, XI, 453), ". . . as, for example, when such a substance [*sōma*: lit. "body"] is laid on the tongue, it greatly dessicates, contracts, and deeply roughens it, such as unripe wild pears (*achrades aōroi*: probably *Pyrus pyraster* Burgsd., or *P. amygdaliformis* Vill.), Cornelian cherries (*krana*: *Cornus mas* L.), and the like; every such substance is called sour [or "astringent": *stryphnon*] since it is intensely bitter [*austēron*]" (Olivieri, I, p. 18, lines 17–20). With some slight syntactical adaptations, Aetius has provided a lucid account of Galen's basic pharmacological theory, using Galen's own words and phrases, but judiciously selected and rearranged so that the reader understands (as best as he would be able) this system of drug classification "by intensity" or "by degree." What has been muddled, scattered, and often repeated in Galen's original texts, has now been compacted, edited, and streamlined. The remainder of Aetius' *Preface* to Book I of his *Medical Books* shows a similar ability, and Galen's enormously influential classification of drugs "by degrees" has emerged in the form in which it would be used by countless physicians and pharmacists until well into the eighteenth and nineteenth centuries.

Once Aetius has completed his redaction of Galen's drug theory, he then proceeds to list alphabetically 418 medicinals of plant origin, almost all quoted from Galen, but with an occasional passage from Rufus, Dioscorides, and Oribasius.[154] Book II lists, in part alphabetically, 195 medicinals,[155] an occasional clipped, simplified recipe of drugs derived from metals (lit. "things mined"), stones, earths, and a wide spectrum of "animal products" (from milk to insects); most entries are quoted from Galen, Oribasius, and Dioscorides, but there are a few citations from Rufus, Antyllus, and Theophrastus. Book II, 196–271 returns to the "drugs by degrees" system[156] and now "fits" the 613 substances into the various grades of heating, cooling, drying, and moistening medicinals, followed by a discussion of the properties (*dynameis*) of foods.[157] Then Aetius turns his attention again to the definition of Galen's puzzling "large" and "small" particles as they relate to the properties of foods,[158] but the source is Oribasius, not Galen. With Book III,[159] Aetius begins to list formulas and recipes for cathartics and similar drugs, and his arrangement of simples in the first two books is explained: one has to be acquainted with the basic components—and the theory of how such ingredients would "work"—before the pharmacologist-physician could

[150] Galen, *Bloodletting* 4 (ed. Kühn, XI, 265).
[151] Aetius I *prooemium* (first eighteen lines) (ed. Olivieri [*CMG* VIII 1], pp. 17–18).
[152] A rare form. Cf. Nicander, *Theriaca* 60.
[153] Ed. Kühn, XII, 4.
[154] Aetius I, 1–418 (ed. Olivieri [*CMG* VIII 1], pp. 30–146.
[155] Aetius II (ed. Olivieri [*CMG* VIII 1], pp. 147–255).
[156] Ed. Olivieri (*CMG* VIII 1), pp. 223–55.
[157] Aetius II, 239 (ed. Olivieri [*CMG* VIII 1], pp. 237–38).
[158] Aetius II, 240–241 (ed. Olivieri [*CMG*, VIII 1]), 237–40.
[159] Ed. Olivieri (*CMG* VIII 1) pp. 256–355.

proceed into prescription of pharmaceuticals by a combined class of action. In Book IV,[160] Aetius takes up formal dietetics, quoting heavily from Galen's *Hygiene*,[161] and one also reads the expected admonitions about exercise and a generally healthy regimen to maintain a healthy body. His earlier discussion of the properties of foods now "fits," as he can suggest which foods would do the best service in the diet, according to the theoretical constructs laid down in Book II, 239–241.[162]

Books V and VI take up diagnostics and the venerated theory of the humors,[163] and some common diseases that can be elucidated through these theories. Only occasional pharmaceuticals appear as they are appropriate to the discussions, but Aetius' major sources have shifted to lengthy quotations from Aretaeus of Cappadocia as well as Galen and Oribasius. Book VII is one of the finest accounts of ophthalmology written in ancient and medieval times,[164] and the discussion is replete with collyria recipes drawn mostly from Galen and Oribasius. Although Aetius does not mention cataract couching, there are clear descriptions of sixty-one eye diseases, showing close acquaintance with the essential anatomical structures.[165] Book VIII is a mixture of materials on inflammations, various plasters, and the like, with many details drawn from Galen's *Compound Drugs Arranged by Place of Ailment*. And although Aetius' complete *Medical Books* are in sixteen books (hence the traditional title of *Tetrabiblon* of the *Biblia iatrika hekkaideka* from the customary division in manuscripts into four *tetrabibloi* to every four *logoi*), one lacks competent modern, well-edited Greek texts,[166] and therefore the pharmacy that teems in the last eight books cannot be accurately assessed. Famous, of course, is Book XVI with its splendid summary of gynecology and obstetrics, but the most often cited Ricci translation is based on the Cornarius *Latin* translation of 1542,[167] and the most recently edited Greek text suffers from a number of inadequacies.[168]

Alexander of Tralles

As Aetius of Amida had carefully redacted earlier pharmacology, so also Alexander of Tralles reworked much of the earlier data into a lengthy compendium of suggested treatment of diseases by their symptomatology, explained through a general pathlogy that assumed a causation of illness from morbid humors. Alexander was born in A.D. 525, and was the son of a physician named Stephen. Our main data for Alexander's family comes from Agathias' *Histories* V, 6.3–6,[169] and Stephen had fathered five sons, all of whom became prominent in their professions: Anthemius, the architect-engineer who designed the magnificent St. Sophia; Olympius, a gifted lawyer; Metrodorus, a pre-eminent grammarian; Dioscurus, a doctor, ". . . who lived out his life in his native city in which he carried on the practice of medicine with great success;"[170] and Alexander, who "lived in Rome, summoned to hold high position."[171] Agathias implies that Alexander's fame had not reached the ears of Justinian, whereas both Anthemius and Metrodorus were well known to the emperor. After much travel and experience, Alexander settled in Rome and died in A.D. 605.

Of all the Byzantine physicians, Alexander of Tralles has exercised the greatest attraction for modern medical historians, due to his direct experience with the practice of medicine, vividly and frequently recorded in his extant books on various aspects of medical treatment. Two relatively modern translations (in French and German) of Alexander's works have been produced, and both Puschmann and Brunet are impressed by what they perceive as the "strikingly modern" approach by Alexander to medicine and pharmacy.[172] Alexander does represent a sharp contrast to the arid scholasticism of Aetius, but both Oribasius and Paul of Aegina were clearly practicing physicians, and

[160] Ed. Olivieri (*CMG* VIII 1) pp. 356–408.

[161] E.g., Aetius IV, 1 (ed. Olivieri [*CMG* VIII 1], pp. 358–59), and Galen, *Hygiene* I, 1 (ed. Koch [n. 109 above], p. 3); and Aetius, IV, 36 (ed. Olivieri, pp. 378–79) and Galen, *Hygiene* III, 3 (ed. Koch, pp. 85–86).

[162] Ed. Olivieri (*CMG* VIII 1), pp. 237–40.

[163] Ed. Olivieri (*CMG* VIII 2), pp. 1–249.

[164] Ed. Olivieri (*CMG* VIII 2), pp. 250–399.

[165] See Emilie Savage-Smith, "Byzantine Ophthalmology" (above in this volume), esp. nn. 61–69.

[166] Barely serviceable "modern" texts of various books of Aetius' *Tetrabibloi* include: G. A. Kostomiris, ed., *Aetiou Logos dōdekatos* (Bk. XII) (Paris, 1892); S. Zervos, ed., *Aetio Amidēnou Logos dekatos kai tritos ē Aetiou Amidēnou Peri daknontōn zōōn kai iobolōn* (Bk. XIII) in *Athēna*, 18 (1905), 241–302; and S. Zervos, ed., *Aetiou Amidinou* [sic] *Logos dekatos pemptos* (Bk. XV) in *Athēna*, 21 (1909), 3–144. Bk. XI is in the Daremberg and Ruelle edition of Rufus, pp. 85–126.

[167] J. V. Ricci, trans., *Aetios of Amida: The Gynaecology and Obstetrics of the VIth Century A.D.* (Philadelphia, 1950).

[168] S. Zervos, ed., *Aetii Sermo sextidecimus et ultimus* (Leipzig, 1901).

[169] R. Keydell, ed., *Agathiae Myrinaei Historiarum* (Berlin, 1967; *CFHB*, II), p. 171.

[170] *Ibid.*

[171] *Ibid.*

[172] Alexander (trans. Brunet), Vol. I. Puschmann, ed., Alexander, I, 75–87, 287–88.

their writings show a sense of the clinic as do those by Alexander. It will not, however, be accurate to describe Alexander of Tralles as a "modern" any more than to designate Galen as such; but Alexander is, indeed, humane and conscientious in his practice, meticulous in his prescriptions, and careful with his command of earlier authorities in medicine. Drugs are scattered throughout Alexander's books, given as recipes for the treatment of specific diseases, usually through the long-lived "treatment by contraries." The occasional complexity of Alexander's drug prescriptions (using 495 different pharmaceuticals) are justified by conflicting symptoms, and many medicinals are recorded as efficacious as verified by personal observation and experience. A critical attitude toward his numerous written sources is characteristic throughout Alexander's works, illustrated by the following, which appears in Book V, 4, "On Viscous Humors and Thick Masses Found in the Lung:"

> This is a true statement by Galen on Archigenes:[173] "He was but a man and it would be difficult for him not to make mistakes in many things, being completely ignorant, making bad judgments, and who provided carelessly written accounts." And I would not have said this about such a learned man, unless Truth itself had not inspired me and urged me on, and did I not believe that keeping silent was sinful. For a doctor who does not speak his opinion commits a great sin and through his silence is greatly to be condemned. But one ought to follow that which Aristotle says he has stated: "Plato is my friend, but the Truth is also my friend; between the two, one must choose the Truth."[174]

Alexander does not devote any of his tracts specifically to drugs, but pharmaceutical therapy is very prominent throughout the various subdivisions, for example, fevers, headaches, what we would call "nervous diseases," melancholia, ophthalmology, the rightly famous "Letter on Intestinal Worms," lung diseases, cholera, gout,[175] and so on. Many of the drug recipes seem original, although the particular ingredients have all been used and defined in Greek, Roman, and earlier Byzantine pharmacy. There are occasionally "new names" applied to certain substances, and this can be illustrated by Alexander's "Armenian Stone," which is part of a recipe in *On Fevers* VII [Quartans] (Puschmann, I, 429). Earlier Greek sources—including the *Papyri Graecae Magicae* XII, 201—had noted the use of *ios chalkou* ("verdigris," or copper oxyacetate, approximately $[C_2H_3O_2]_2Cu{\cdot}Cu[OH]_2{\cdot}5H_2O$), but Alexander's *Armeniakos lithos* has taken the place of *ios chalkou*. This "new" substance had been foreshadowed in Dioscorides, *Materia medica* V, 90, and if we understand the geological chemistry the "Armenian Stone" is a combination of copper oxyacetate, azurite ($2CuCO_3{\cdot}Cu[OH]_2$), and malachite ($CuCO_3{\cdot}Cu[OH]_2$).[176] Roman and Byzantine pharmacy could substitute one "kind" of copper oxyacetate for another, and it is probable that Alexander knew the "Armenian Stone" in the same role as had been played by verdigris in earlier prescriptions. The remainder of the recipe "On the Armenian Stone" suggests that Alexander's "new" pharmacy consisted of rearrangement of ingredients according to his experience:

> The stone, which is called "The Armenian," given washed or unwashed in a dosage of 4 *keratia* [c. 800 mg./12 grains] works well for all forms of quartan fever, since it [performs] as no other for the evacuation of black bile. Washed in water, it completely purges the lower bowels, but unwashed it is an emetic which does not cause too much heating, unlike the others. But if some [of your patients] regard the solution of "the stone" with disgust, make little pills using the following ingredients:
>
> 4 *grammata* [c. 4.6 grams/4 scruples/80 grains] of *pikras* [an aloe-honey mixture][177]
>
> 3 *grammata* [c. 3.5 grams/3 scruples/60 grains] of *epithymon* [lesser dodder, *Cuscuta epithymum* (L.) Murr.][178]
>
> 1 *gramma* [c. 1.2 grams/1 scruple/20 grains] of *agarikon* [prob. a tree mushroom of *Boletus* spp.][179]
>
> 1 *gramma* of *Armeniakos lithos*
>
> 5 "berries" of *karyophylla* [cloves, *Eugenia caryophyllata* Thunb.; here the sun-dried, unopened flowerbuds][180]
>
> 5 *grammata* [c. 5.9 grams/5 scruples] of *skammōnia* [scammony, *Convolvulus scammonia* L.][181]

[173] More-or-less Galen, *Drugs by Location* II, 1 (ed. Kühn, XII, 535).

[174] Alexander (ed. Puschmann), II, p. 155; French trans. by Brunet, III, 124–25.

[175] Alexander (ed. Puschmann), I, 290–439 (fevers; in 7 books); I, 465–507 (headaches); phrenitis, lethargy, epilepsy, etc. (I, 508–91); melancholia (I, 591–612); ophthalmology (II, 2–70); intestinal worms (II, 586–600); lung diseases (II, 146–244); cholera (II, 320–34); gout (II, 500–86).

[176] Cf. D. Goltz, *Studien zur Geschichte der Mineralnamen in Pharmazie, Chemie und Medizin von den Anfängen bis Paracelsus* (Wiesbaden, 1972; *SA* Beiheft 14), 146–47.

[177] Juvenal VI, 180, and Galen, *Hygiene* VI, 10.19 (ed. Koch [n. 109 above], p. 188).

[178] Dioscorides IV, 177 (ed. Wellmann, II, pp. 326–27). Galen, *Hygiene* VI, 7.18 (ed. Koch [n. 109 above], p. 182).

[179] Maggiulli, *Nomenclatura* (n. 55 above), 85–88.

[180] Paul of Aegina VII, 3 (ed. Heiberg, II, 211). A. F. Hill, *Economic Botany*, 2nd ed. (New York, 1952), 445–46. J. W. Purseglove, E. G. Brown, C. L. Green, and S. R. J. Robbins, *Spices* (London, 1981; 2 vols.), I, 237 ("fruits").

[181] Theophrastus, *HP* IV, 5.1, and IX, 1.3. Nicander, *Alexipharmaca* 565. Dioscorides IV, 170 (ed. Wellmann, II, 318–19).

> Mix with juice of *kitrion* (citron, *Citrus medica* L.),[182] or with *krokomēlon* (a jam made from quince [*Cydonia oblonga* Mill.] and saffron [*Crocus sativus* L.]), or with *rhodomēlon* (a jam made from roses [*Rosa gallica* L.] and quince),[183]or with *rhodomeli* (rose-honey mixture). The dose is 2 *grammata* [c. 2.4 grams/2 scruples/40 grains].[184]

It is significant that an alchemical papyrus from late Roman or Byzantine Egypt also has the combination of water and verdigris,[185] so that Alexander has recorded a common association of "washing" the "green rust" that is copper oxyacetate. The remaining substances in the recipe are known from earlier Greco-Roman sources, and even though the cloves appear exotic, they were known in Roman pharmacy in the first century,[186] but with the close links in the traditions between Cosmas Indicopleustes and Alexander,[187] it seems that this peculiar *hapax legomenon* may reflect a special connection with the spice trade from the Far East. The text of Alexander, *On Fevers* VII [Quartans] (Puschmann, I, 429 and 431) shows a careful assessment of drugs in the context of the ancient humoral pathology, and it appears that this recipe—and many others by Alexander—was compounded after a lengthy experience with patients who exhibited quartan fever. Alexander's pharmacy indicates that Byzantine drug lore was anything but repetitive and static: it shows a continual attempt by the best of the early Byzantine physicians to utilize the traditional pharmacopoeia in new patterns, while retaining the theoretical context of Hippocratic and Galenic medical theory.

Theophilus Protospatharius and Paul of Aegina

Before considering the lucid summary of pharmacology by Paul of Aegina (*fl.* in the 640s in Alexandria),[188] the works of Theophilus Protospatharius should be mentioned. Although there has been debate concerning the century in which Theophilus practiced medicine,[189] the dating by Krumbacher seems to have stood up to scrutiny; we may thus continue to assume that Theophilus lived during the reign of Heraclius (A.D. 610–641). Whenever one dates Theophilus, there can be little doubt about his masterful conglomeration of the ancient medical classics with the Byzantine Christian outlook, nicely exemplified by his *On the Structure of the Human Body*,[190] which fuses Galen's demiurge and teleology in *Use of Parts* with a continually emphasized *ho demiourgos theos hēmōn*.[191] Of interest for Byzantine pharmacy is the short fragment of Theophilus' *On Excrements*,[192] indicating a continued use of dungs in medicinals. And of fundamental interest in the fresh approaches of Byzantine medical practice and diagnosis is Theophilus' *On Urines*,[193] which became the probable ancestor of so many Byzantine works on the topic.

The seventh of Paul's *Seven Books* is devoted solely to drugs and pharmaceuticals and represents a culmination of the Greek, Roman, and early Byzantine search for clarity in drug lore. In the first six books, Paul does indeed give a great number of prescriptions as treatments for diseases, but in the seventh, he gathers all of the 600 plants and 80 non-botanical ingredients into a crisply clear alphabetical catalogue. First, he pens a precisely worded introduction to drug theory, adapted from Oribasius and Aetius:

> On the Mixtures [*kraseis*] of Substances as Indicated by Their Tastes. It is not adequate to judge from the smell concerning the *krasis* of things perceived by the senses. Substances without odors are made up of large particles, but it is not clear whether they are hot or cold. And things which do have an odor, to a certain extent, are made up of small particles and are hot. But the degree of the smallness of their parts, or of their heat, is not apparent, because of the inequality of their substance. And still more uncertain it is to judge them according to their colors, since with every color are found hot, cold, drying, and wetting substances. In tasting, however, all parts of the substances undergoing tasting come into contact with the tongue and stimulate the sense of taste, and thus one can judge clearly their properties in their *kraseis*. Astringents, therefore, contract, obstruct, condense, dispel, and thicken; and added to all of these properties, they are cold and drying. That which is acidic cuts, divides, thins, removes obstructions, and cleans without making heat; but that which is acrid is like the acidic in being thinning and purging, but it differs from it: the acidic is cold, and the acrid is hot; moreover, the acidic repels, but the acrid attracts, consumes, dissolves, and promotes scab [or scar] formation. Similarly, that which is

[182] Dioscorides I, 115.5 (ed. Wellmann, I, 109). Galen, *Simples* VII, 12.19 (ed. Kühn, XII, 77).

[183] Cf. Alexander (ed. Puschmann), I, 479, 503, 523, 613, and II, 371, 495, 567 [further reffs. to the rose-quince jam]; and cf. Alexander, I, 327, 383, 415, 613, and II, 61, 275, 371, 591, 593 [further reffs. to rose-honey].

[184] Alexander (ed. Puschmann), I, 429 and 431 (Greek text).

[185] *PGM*, XII, 193–201.

[186] Pliny, *Natural History* XII, 30.

[187] The "Cosmas," to whom the *Fevers* is dedicated (Puschmann, I, 289) is probably Cosmas Indicopleustes, whose father was an early medical teacher of Alexander (Puschmann, I, 83, following Meyer, *Botanik*, II, 384).

[188] Hunger, "Medizin," 302.

[189] *Ibid.*, 299.

[190] Ed. Greenhill.

[191] Hunger, "Medizin," 299.

[192] Ideler, I, 397–408.

[193] Ideler, I, 261–83.

bitter cleans the pores, is cleansing and thinning, and cuts the thick humors without any heat perceived by the senses. What is wet is cold, thick, and promotes condensation, contraction, blockage, necrosis, and torpidity. By contrast a salty substance contracts, strengthens, preserves as in pickling, and dries without detectable heat or coldness. What is sweet relaxes, "cooks" [viz. promotes "coction"], softens, and lessens density; and what is oily moistens, softens, and relaxes.[194]

On the Orders and Degrees of the *Kraseis* [adapted from Oribasius and Aetius]. A moderate drug is of the same *krasis* as that to which it is applied, so that it does not dry, moisten, cool, or heat, and it should not be called dry, wet, cold, or hot. But that which is drier, moister, hotter, or colder, is thereby known from its dominant property [*dynamis*]. It will be satisfactory to make—for practical use—four orders [*taxeis*] according to the dominant property, naming the substance hot as appropriate to the first order, when it would heat indistinctly and it would require reason to demonstrate its property; likewise this would be true for the cold, dry, and wet, when the dominant property requires reason to demonstrate its existence, and it has no strong or apparent property as perceived by the senses. And such substances as are clearly those having drying, wetting, heating, and cooling properties may be said to be in the second order. Such substances which have these properties, but not to an extreme degree even though they are strong, may be said to be in the third order, but such substances as those which are hot enough to cause scarring or burning are in the fourth order. Similarly, such substances as those which are so cold as to cause necrosis are also in the fourth order. Nothing, however, is found drying in the fourth order that does not burn: for that which dries to an extreme degree [*akrōs*] also always burns, for example, chalcopyrite [prob. $CuFeS_2$],[195] rock alum [a ferrous sulfate],[196] and quicklime [CaO].[197] But a substance may be in the third order of dessicants without being caustic, such as those substances which are sharply astringent, *e.g.* the juice of unripe grapes, sumac [*Rhus coriaria* L.],[198] and alum [prob. a potash alum: $KAl(SO_4)_2 \cdot 12H_2O$].[199]

Comparing this concise summary with the attempts by Galen to bring some sort of order and clarity into the chaos of drug lore delineates the Byzantine ability in choosing essentials and explicating them with great precision. Galen had posed questions and—having rejected the brilliant "drugs-by-affinity" system of Dioscorides—attempted an ordering for pharmaceuticals; but Galen had failed to provide a satisfactory method, even though he perceived three separate approaches evinced in his *Simples*, *Drugs by Location*, and *Drugs by Kind*. Oribasius had excerpted much of Galen, and had shown a method of extraction of drug theory.[200] Aetius of Amida had further refined the attempts by Galen to comprehend medicinals by a "system of degrees," but even though there is a judicious care in the lengthy preface on drugs and drug lore in Aetius, *Medical Books* I, there remains a muddled character and a somewhat jagged result from the painstaking juxtaposition of the carefully chosen extracts of Galen's drug theory. Alexander knows his Galen, but chooses to concentrate on the practical aspects of drug lore, so that one does not find a specific "book" on pharmaceuticals either in Alexander's separate tracts on fevers, or in his extant Twelve Books on Medicine: the theory of drugs is embedded in the recipes recorded. Paul's distillation of classical drug theory has finally captured the essence, and it has the characteristics of filtration and the reworked theory seen earlier in Oribasius and Aetius. Paul is also deeply learned in the medical classics, but his compilation bears the marks of an age skilled in ensuring that adaptation accompanied a creative synthesis borne of direct clinical experience combined with venerated assumptions applied to the "modern" age of Heraclius and the Arab invasions of Egypt, Palestine, Syria, and beyond. In the broader historical and cultural context, the early Byzantine physicians should be viewed as part of the same tendencies which produced the brilliant compactions of Roman law from the *Codex* of Theodosius through the *Institutes*, *Digest*, and *Novella* of Justinian.

Appendix: The Papyri and Byzantine Medicine on Multi-Ingredient Incense. *Kyphi* and *Krisma*

Among several hundred medicinals mentioned in the collection of Greek and Coptic papyri known as the *Papyri Graecae Magicae*,[201] occur the names

[194] Paul of Aegina VII, 1 (ed. Heiberg, II, p. 185).

[195] Dioscorides V, 74 and 100. *PGM*, XII, 195 and 399. Goltz (n. 176 above), 156–57 (μίσυ).

[196] Χαλκῖτις most often $Fe_4(OH)_2(SO_4)_5 \cdot 18H_2O$, as in the χαλκῖτις στυπτηρίη of the Hippocratic *Wounds* 14 (ed. Littré, VI, p. 416); ἄνθος αἰγυπτίη χαλχοῦ ὀπτὸν, στυπτηρίη αἰγυπτίη ὄπτη. Dioscorides V, 99. Goltz (n. 174 above), 154–55.

[197] Here τίτανος, as contrasted to the usual ἄσβεστος. Goltz (n. 176 above), 171.

[198] Theophrastus, *HP* III, 18.3. Dioscorides I, 108 (ed. Wellmann, I, pp. 101–2).

[199] Here the common στυπτηρία, as in Aristotle, *Historia Animalium* 547a20.

[200] E.g., Oribasius, *Medical Collection* XIV, 5 and 11 (ed. Raeder, II, 185–86 and 193), extracted from Galen, *Simples* I, 38, and V, 26–27 (ed. Kühn, XI, 450–51, and 785–87). Behind Oribasius, *Medical Collection* XIV, 5.1–2 (ed. Raeder, II, 185)—as quoted by Galen—are Plato, *Timaeus* 65B-66C, and Theophrastus, *De causis plantarum* VI, 4.1.

[201] My "count" is 425 different herbs, minerals, insects, dungs, etc. An English translation of the entire *PGM*, with commentar-

of two kinds of multi-ingredient incense, *kyphi* and *krisma*.[202] The anonymous writers apparently presume that their readers would know the ingredients for these two incenses, much as they have assumed a knowledge of the numerous medicinal plants, insects, minerals, and other animals employed in a curious mixture of rational and irrational medical-cum-magical prescriptions.[203] These papyri generally emerge from late Roman and Byzantine Egypt, and one may be sceptical of claims that Greek medicine had made its way into the everyday traditions of the native Egyptians, but it also must be recalled that a common knowledge of plants and animals among ancient peoples would be "taken for granted,"[204] a factor often ignored by modern scholars, who presume a constant specialized expertise, analogous to modern medicine and pharmacy. The magical papyri, however, afford a rare glimpse into the actual "medicine of the masses" (at least in Roman and Byzantine Egypt), and this medicine has great affinity to the religious/magical medicine explicated by Gary Vikan in this collection of essays.[205] If, however, the "upper class" pharmaceutical sources had not recorded the exact names of plants and herbs,[206] one would be reduced to learned speculation concerning ingredients, particularly in the cases of drugs compounded from a number of substances. *Kyphi* and *krisma* show a sophistication of both compounding drugs among the so-called common folk, and they also indicate a developing history of their own, destroying the accepted mythology of modern medical historians that ancient medicine developed to a certain point, and then remained utterly static for countless centuries. By contrast to this assumption, the Greek texts show that Egyptian priest-physicians—and their non-Egyptian Greek, Roman, and Byzantine medical counterparts—were in a continual process of "improving the product." One is able to trace *kyphi* from the first century through the mid seventh century, and the mentionings in the magical papyri indicate that such compounds were available far beyond the urban centers of the Roman and Byzantine Empires.

Dioscorides is well acquainted with Egypt, and his *Materia medica* has the first Greek record of *kyphi*, a multi-ingredient incense that not only was to be burned for its heavy and pungently aromatic odor, but which also was an effective medicinal salve—one could even eat it for presumed benefits. Dioscorides writes that in the Egypt of his day (the mid first century) there were many formulas for *kyphi*, and that he is setting down only one of them (*Materia medica* I, 25 [Wellmann, I, pp. 28–29]), and he lists ten ingredients with measures: ½ *xestēs* [c. ½ pint] of nut grass [*kyperos*: *Cyperus rotundus* L.]; ½ *xestēs* of ripe juniper berries [*Juniperus communis* L.]; 12 *minae* [c. 11 lbs.] of raisins, "the seeds having been removed"; 5 *minae* [c. 4.5 lbs.] of purified pine resin [*rhētinē apokekatharmenēs*]; 1 *mina* [c. 15 oz.] of sweet flag [*kalamos arōmatikos*: *Acorus calamus* L.]; 1 *mina* of camel's thorn (oil) [*aspalathos*: *Alhagi camelorum* Fisch.]; 1 *mina* of camel grass (oil) [*schoinos*: *Cymbopogon schoenanthus* Spreng.]; 12 *drachmai* [c. ¾ lb.] of myrrh [*smyrna*: *Commiphora* spp.]; 9 *xestai* [c. 9 pints] of old wine; and honey as part of the preparation instructions, viz.:

> Having removed the seeds from the raisins, pound and triturate them with the wine and the myrrh, and having pounded and sifted the rest of the ingredients, combine them all to soak for one day; then, having boiled the honey until it has a glutinous consistency, mix it carefully with the melted pine resin, and then having carefully pounded together the rest of the ingredients, put up for storage [this incense] in an earthenware vessel.[207]

Dioscorides does not say if other *kyphi* recipes in his time were more complicated, or if they had more ingredients, but Plutarch, *Isis and Osiris* 383E(80)–384C lists a *kyphi* formula with sixteen ingredients. Ten are the same as in Dioscorides' recipe (honey, wine, raisins, nut grass, pine resin, myrrh, camel's thorn oil, two sizes [large and small] of juniper berries, and sweet flag), but Plutarch's list adds six more ingredients: hartwort (*seselis*: *Tordylium officinale* L.), mastic (*schinos*: *Pistacia lentiscus* L.), Dead Sea bitumen (*asphaltos*: $C_nH_{2n}O_n$ + V, Ni, Mo [traces]), rush (*thryon*: *Juncus glaucus* Sibth.), spinach dock (*lapathon*: *Rumex patientia* L.), and cardamon (*kardamōmon*: *Elettaria cardamomum* [L.] Maton.). Unlike a similar recipe, reduced to a medical poem by Damocrates,[208] Plutarch provides no measures, nor does he give any instructions for the preparation of the *kyphi*. He simply writes that "the ingredients

ies, will shortly appear (ed. H. D. Betz, and a team of a dozen scholars), to be published by the University of Chicago Press.

[202] *PGM*, IV, 1313–14, 2971; V, 221; VII, 538, 873.

[203] Paralleled in the Greek texts known as the *Cyranides*. Dimitris Kaimakis, ed., *Die Kyraniden* (Meisenheim am Glan, 1976).

[204] G. E. R. Lloyd, *Science, Folklore and Ideology* (Cambridge, 1983), 119–35.

[205] See G. Vikan, "Art, Medicine and Magic in Early Byzantium" above in this collection of essays.

[206] Esp. Theophrastus in *HP* and *De causis plantarum*, and Dioscorides in his *Materia medica*.

[207] Dioscorides I, 25 (ed. Wellmann, I, pp. 28–29).

[208] Damocrates in Galen, *Antidotes* II, 2 (ed. Kühn, XIV, 117–19).

are not compounded haphazardly, but whenever the drug-preparers [*myrepsoi*] are mixing these substances, sacred writings are read to them."[209] Since the *Suda* mentions a work by Manetho called *Preparation of Kyphi-Recipes*,[210] Plutarch probably gained his listing of the sixteen ingredients from this lost book,[211] which suggests that Dioscorides' first-century *kyphi* recipe represented a pared-down version of earlier Ptolemaic Egyptian listings for *kyphi*, in turn derived from very ancient Egyptian origins.[212] "They use *kyphi* in both drinks and ointments,"[213] so Plutarch says, and even though he gives some farfetched speculation on why this incense should have been so valued as a drug, Plutarch has recorded an important detail: *kyphi* was commonly consumed in a drink.

Paul of Aegina III, 28.2 (ed. Heiberg, I, p. 206) mentions a *kyphi*, called "the lunar" (*kyphi selēniakon*), which is termed *chrisma selaniakon* in the papyri.[214] Paul writes that, in addition to being used to give a pleasant (if heavy) odor, it is to be rubbed into the forehead as a salve. Oribasius had recorded a formula for a "lunar kyphi" with twenty-five ingredients,[215] while Paul's detailed recipe for the "lunar incense-salve" has twenty-eight ingredients.[216] Some of the ingredients overlap with those given by Dioscorides and Plutarch quoting Manetho, and the anonymous authors of the magical papyri indicate that by the fourth century, some *kyphi* recipes had become known by the more specific *chrismata*, perhaps to suggest their medical use as oily unguents and incenses, but not as drinks or an "edible" drug.[217] Yet the compiler of the papyrus can assume his reader would "know" the ingredients of this complicated incense-salve, and Oribasius and Paul seem to presume an equivalence of *kyphi* with *krisma*, which may indicate that the *kyphi* label had, indeed, become the more "Hellenic" *krisma* outside Egypt. The function, however, of the late Roman and early Byzantine *kyphi-chrismata* generally followed the hallowed Egyptian pattern, while adding an ever more impressive array of ingredients, exotic and local. Paul III, 28.2, is illustrative:

> Another incense-salve of 28 ingredients, called "the lunar"
> 7 *ounkiai* [c. 191 grams] of *bdellion*: bdellium, either the aromatic gum of the Haddi tree, or, the bdellium of the Mukul "myrrh" tree (*Commiphora erythraea* Engl. var. *glabrescens* Engl., or, *C. mukul* Engl.)
> 7 *ounkiai* of *helenion*: either calamint [= basil thyme], or elecampane [= horseheal] (either *Satureja calamintha* [L.] Scheele, or *Inula helenium* L.)
> 2 *ounkiai* [c. 55 grams] of *schoinos*: camel grass (*Cymbopogon schoenanthus* Spreng.)
> 5 *ounkiai* [c. 136 grams] of *sphagnos*: horehound [= false dittany] (*Ballota acetabulosa* [L.] Bentham)
> 50 small juniper berries (*arkeuthides mikrai*): *Juniperus communis* L.
> 5 *ounkiai* of *kardamōmon*: cardamon (*Elettaria cardamomum* [L.] Maton.)
> 7 *ounkiai* of *aspalathos*: camel's thorn oil (*Alhagi maurorum* Medik.)
> 5 *ounkiai* of *kassia syrinx*: cassia "quill" (*Cinnamomum cassia* Blume.)
> 2 *ounkiai* of *nardostachys*: spikenard oil (*Nardostachys jatamansi* DC)
> 5 *ounkiai* of *kyperos*: nut grass (*Cyperus rotundus* L.)
> 4 *ounkiai* [c. 109 grams] of *asphodelos rhiza*: asphodel root (*Asphodelus ramosus* L.)
> 4 *ounkiai* of *brathu*: savin (*Juniperus sabina* L.)
> 3 *ounkiai* of *kyparissos* (*sperma*): cypress seeds (*Cupressus sempervirens* L.)
> 3 *ounkiai*. [c. 82 grams] of *nardos Keltikē*: valerian (*Valeriana celtica* L.)
> 3 *ounkiai* of *malabathron* (*meta tōn phyllōn*): Indian cassia + leaves (*Cinnamomum tamala* [Buch.-Ham] Nees. & Eberm.)
> 3 *ounkiai* of *rhoda xēra*: dried roses (prob. *Rosa gallica* L.)
> 2 *ounkiai* of *kostos*: costus (*Saussurea lappa* C. B. Clarke)
> 2 *ounkiai* of *krokos*: saffron crocus (*Crocus sativus* L.)
> 7 *ounkiai* of *ladanon*: gum labdanum (*Cistus ladaniferus* L.)
> 7 *ounkiai* of *symrna*: myrrh (*Commiphora myrrha* [Nees.] Engl.)
> 2 *litrai* [c. 655 grams] of *staphis* (*enkigartistheisos*): pitted, dried grapes = raisins (prob. *Vitis vinifera* L.)
> 2 *litrai* of *ischas liparos*: dried, fat figs (*Ficus carica* L.)
> 8 *ounkiai* of *strobilos*: kernels of the stone pine (prob. *Pineus pinea* L.)
> 1 *litra* [c. 327 grams] of *terebinthinē*: Chian turpentine from terebinth (*Pistacia terebinthus* L.)
> 7 *ounkiai* of *styrax*: storax gum (*Styrax officinalis* L.)
> 1 *litra* of *phoinikoi liparoi*: dates of the date palm (*Phoenix dactylifera* L.)
> 5 *litrai* of *meli*: honey [c. one and two-thirds kilograms] *oinos euōdes to akroun*: fragrant wine as is sufficient

Oribasius' "lunar salve" has almost all of the same ingredients and measures as seen here in Paul's

[209] Plutarch, *Moralia: Isis and Osiris* 383E(80).

[210] *Suda*, M no. 142 (ed. Adler, Vol. III, p. 318).

[211] Thus this is Frg. no. 87 in W. G. Waddell, ed. and trans., *Manetho* (Cambridge, Mass., 1940 [Loeb: in vol. *Manetho. Ptolemy: Tetrabiblos*], pp. 202–5).

[212] G. Ebers, "Ein Kyphirecept aus dem Papyros Ebers," *Zeitschrift für ägyptische Sprache und Altertumskunde*, 12 (1874), 106–11. Further reffs. in J. G. Griffiths, ed., with trans. and comm., *Plutarch's De Iside et Osiride* (Cambridge [for Univ. Wales Press], 1970), 569 n. 4.

[213] Plutarch, *Moralia: Isis and Osiris* 384B(80): τῷ δὲ κῦφι χρῶνται καὶ πώματι καὶ χρίματι.

[214] *PGM*, VII, 873.

[215] Oribasius, *Synopsis for Eustathius* III, 220 (ed. Raeder, p. 121).

[216] Paul of Aegina VII, 22.5 (ed. Heiberg, II, p. 394).

[217] Cf. Galen, *Hygiene* VI, 4.6 (ed. Koch [n. 109 above], p. 177).

recipe: Paul has added only the gum labdanum, saffron crocus, and the Indian cassia. One can presume that once mixed, this salve-incense would be doled out carefully and would have lasted for several months.

Paul VII, 22.1 (ed. Heiberg, II, p. 393) makes it clear that early Byzantine pharmacy placed the *kyphi* among perfumes, but he also tells us that the aromatic function is a minor one for especially the *kyphi*: one uses them as drugs, to be taken internally for the production of accumulation of mucus, and as preventative measures during times of epidemics, as well as for freeing up the lungs and for liver ailments caused by cold. Following are four recipes: perfume of roses, perfume of lilies, the "Great *Kyphi*, called 'The Solar'" (36 ingredients), and the 28-ingredient "lunar *kyphi*" given above in detail. Dioscorides had been one of the first Greco-Roman physicians to recognize the usefulness of the traditional Egyptian multi-ingredient incense recipes, and the *kyphi/krismata* soon occupied an important place in Roman pharmacy, as evinced by Damocrates' poem as quoted by Galen. And Paul, in the seventh century, probably indicates why these curious, quasi-folkloric incenses should have been regarded as very useful by formal pharmaceutics: *kyphi* occupied a place between drugs prepared as lozenges to be dissolved in the mouth, and those drugs thought to be true antidotes.[218]

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[218] Paul of Aegina VII, 22.1 (ed. Heiberg, II, p. 393).